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## ECONOMIC POLICY, ORGANIZATION AND MANAGEMENT

### IMPACT OF FASTER FIXED CAPITAL REPLACEMENT EXPLORED

Moscow VESTNIK MOSKOVSKOGO UNIVERSITETA—EKONOMIKA in Russian No 4, Jul-Aug 80  
pp 44-47

[Article by N. Yu. Grishina: "The Economic Efficiency of an Accelerated Replacement of Obsolete Fixed Capital"]

[Text] The economic strategy of the Party that was worked out by the 24th and 25th CPSU Congresses for the present stage in the development of communism amounts to an increase in the efficiency of social production. One of the basic lines pursued by this strategy is an increased efficiency in the use of fixed production capital along with its improvement and replacement. The directives of the 25th CPSU Congress relative to the 1976-1980 five-year plan for the development of the USSR national economy stipulate that "by following a uniform technological policy in all sectors of the national economy, the technological retooling of production be accelerated and a widespread adoption of progressive engineering and technology which would insure an increased productivity of labor, an improved quality of production and an increase in the yield of investment be implemented."<sup>1</sup>

Characteristic of these processes is the fact that they are taking place under the conditions and through the direct influence of the present-day scientific and technical revolution, which is precipitating major changes in the conditions and means of efficient utilization of fixed production capital and in the economic and physical conditions for its replacement (wear and obsolescence, their rate and relationship to one another all modify the place and role of a specific piece of equipment in the overall technological chain of production).

The nature of the present-day scientific and technical revolution as far as its influence on the depreciation of fixed capital is concerned amounts to the fact that the obsolescence of production equipment is becoming more and more significant and decisive, since the service life of that equipment consistently exceeds the onset of its obsolescence. The elimination of the objectively generated discrepancy in the time factors applicable to wear and obsolescence requires the resolution of many economic problems. The major task is to make the time periods involved coincide more closely, since if one exceeds the other, this has a negative impact on the economy of production. Thus, if the fixed capital wears out before it becomes obsolete, it must be replaced by equipment that is comparable to it in efficiency, and the resulting effect is minor. In this case it would be wiser to extend the service life of the equipment through preventive maintenance and overhauls until it becomes obsolete, i.e. until a more efficient design with the same function has been

created and widely distributed. But this measure is far from being without its limitations, since at a given point in the depreciation process expenditures for repair and maintenance are so great that the operation of the equipment in question becomes inexpedient. "At the present time many types of industrial equipment undergo an average of three to four overhauls during their period of service, and whereas the first overhaul is economically justifiable, expenditures for the second will amount to almost as much as it would cost to obtain a new piece of equipment, and the third, and even more so the fourth, overhauls are completely unprofitable."<sup>2</sup> On the other hand, if obsolescence occurs first, a dilemma arises: to replace unamortized equipment or to use the old equipment and thereby not reap the benefits from the new.

An analysis of the data for replacing fixed capital testifies that the amortization periods for many types of equipment are too long and only inadequately take the rate of technical progress into account. The designated periods of operation for metal-cutting equipment in the machine-building and metal-working sectors are from 14 to 30 years.<sup>3</sup> It should be noted that in the amortization norms that went into effect in 1975, there is a greater differentiation among the fixed capital operation periods for most groups of front-line equipment. This reflects a more thorough specification of the reproduction requirements of certain types of equipment, although factual retirement data indicate that such periods actually do not reflect the specific reproduction cycles of certain types of fixed capital. On the one hand, there is a large quantity of equipment in operation in the national economy that is of a considerably greater age than the standard service life, and on the other hand, equipment that has not been in operation the standard length of time is being retired and replaced with new equipment. The results of an examination of documentation on the scrapping of metal-cutting machine tools belonging to some enterprises of the Ministry of Tractor and Agricultural Machine Building are indicative of this. At the Vladimir Tractor Plant, for example, in 1977-1979 up to 15 percent of the equipment being retired had been in operation less than 10 years; 50-55 percent had been in operation 10 to 20 years, and 30-35 percent, more than 20 years.<sup>4</sup> But of the 15 amortization norms for metal-cutting lathes the standard operation period is 11 years only for complex and special lathes and for automatic production lines. For most types of metal-cutting machines the period of operation is 15-20 years. Thus, a large part of the machines were retired before the end of the standard operation period, whereas a large quantity of old equipment remains in operation in the industry even now.

Under conditions of the present-day scientific and technical revolution, when technological interdependence within each production sector is on the increase, what needs to be reproduced are, as a rule, entire complexes of various types of industrial equipment. An examination of an obsolescent technological line in its entirety considerably simplifies the scheduling of machine and equipment replacement. In any given enterprise there is always production equipment of various ages and various degrees of efficiency, and at any given moment specific machines or groups of them are not worn out to the same extent. In an examination of the technological line as a whole it becomes obvious that each specific machine depends on the entire system. The isolated replacement of one machine cannot have positive results unless the entire technological process is reorganized. This is justified only when it involves the entire complex, when the entire technological process is obsolescent.



On the other hand, in the case where obsolescence occurs more rapidly than anticipated and the entire technological process must be replaced, all machines and equipment are retired, regardless of how long they have been in operation. Often such machines have been in operation only five, three, or even fewer years. This is the main explanation for the high percentage of equipment retirement before it actually becomes obsolete.

A comparison of the average service life and service life norms of operation (amortization periods) for fixed capital by sectors of industry indicates that the set norms often exceed the actual service life by 5-10 years. The actual service life, which is shorter than the norm, averages 10-15 years. This cannot be considered satisfactory under present-day conditions. The discrepancies between the actual and the normative service lines attest to the excessive length of the latter. It must be noted, however, that the actual service life periods are calculated as the average ones for a given sector where a large quantity of "newer" equipment is being retired, just as the reverse is true for a sector where a large number of machines that have considerably outlived the normative service life are still in operation.

In analyzing the process for replacing fixed production capital it must be noted that at the present time the most urgent problem is not one of losses connected with the replacement of unamortized production equipment and the premature withdrawal of equipment from operation, but rather one of losses that occur from using outdated technology and delaying the introduction of new technology into the production process. The national economy suffers from the use of obsolete machines and equipment primarily because of greater expenditures of both living and embodied labor. Under these conditions the problem of replacing fixed capital should be resolved through an efficient utilization of living and embodied labor. Because of the limited labor resources in certain sectors of industry, expenditures must be increased for replacing obsolete and worn out equipment with new equipment that would assure not only that the need for additional manpower would decrease, but also that the rate of freeing available manpower could be accelerated.

Under present-day conditions, with radically new equipment being introduced every five to seven years,<sup>5</sup> its utilization on a more intensive basis is acquiring particular importance for bringing about a closer correlation between the time periods for wear and for obsolescence.

The entire period of development of the Soviet economy has been accompanied by a rapid increase in the machine-tool inventory, which has had certain negative results; the expenditures on maintenance and repair are increasing, the shortage of machine-tool operators is becoming more acute<sup>6</sup> and less incentive is being provided to improve the utilization of the existing inventory of equipment. At the present time the rate of increase in the total count of available machine-tools is slowly waning, as under the conditions of the present-day scientific and technical revolution, the basic trend is to curtail the growth of the machine-tool inventory while increasing its per-unit productivity, improving its utilization, and accelerating the rate of its replacement. However, at the existing replacement rates, where only about 20 percent of the fixed capital that is put into operation goes for replacement and approximately 80 percent goes for expansion,<sup>7</sup> two decades will be needed to replace the equipment that is now in use. It is perfectly obvious that in view of the accelerated technical progress, the volume of replacement is inadequate. In this connection, the question arises as to whether it is advisable to direct the

greater part of new fixed capital toward expanding the current inventory. It would be more advantageous to replace a greater part of the outdated and inefficient machines and equipment and to use the new, highly productive ones more intensively. Moreover, increased production capacity must be achieved not through an expansion of the existing stock but rather through full utilization and increased efficiency of existing capacities, considering the fact that at the present time a significant part of industry's fixed production capital is not yielding anticipated returns. The equipment in operation is being inadequately utilized, and in recent years the under-utilization of equipment in the machine building industry has been on the increase. A low shift coefficient is characteristic of the equipment in operation. During the last decade the shift coefficient for the operation of metal-cutting lathes and foreign and pressing equipment was 1.3-1.4, and the shift coefficient for the operation of casting equipment was 1.5.<sup>8</sup> Such a coefficient means that the equipment is in operation 10-12 hours a day. The maximal productivity from new technology can be realized only through a normal, two-shift operation. The growing cost of machines and equipment, the shorter service life, and the acceleration of replacement makes the problem of improving their utilization with respect to both capacity and time increasingly more acute. In the 10th Five-Year Plan it was stipulated that the shift coefficient in the machine building industry be increased, on the average, by 20-30 percent, and thus it should reach 1.6-1.8. An increase in the shift coefficient produces many positive results: in particular, the structure of the operating capital is improved through the retirement of the outdated equipment while meeting the required production targets by operating more advanced equipment in two shifts. Under these conditions broad possibilities arise for taking obsolete equipment out of the production process. At the same time, with an improvement in the structure of fixed capital through the retirement of a large part of the obsolete equipment, a reserve fund of obsolescent, but still functional fixed capital can be created with the purpose of maintaining and increasing the potential capacity of industry productivity and meeting unforeseen emergencies.

The resolutions of the 25th CPSU Congress emphasize the need to investigate the theoretical problems of a developed socialist society. The same need exists for the investigation of economic problems and specifically the problems of the use and replacement of fixed production capital. In resolving these problems of management one must begin with the special features [or peculiarities] of the current stage of economic development. The impact of obsolescence should be taken into account already in the design stage of new machinery and equipment. The determination of replacement rates and of the process of renovating the industrial apparatus while taking into account an accelerated rate of obsolescence will provide major economic benefits and will make it possible to considerably improve the structure of fixed production capital.

#### FOOTNOTES

1. "Materials from the 25th CPSU Congress," Moscow, 1979, p 170.
2. "Problemy effektiivnosti novoy tekhniki" [Problems Concerning the Efficiency of New Technology], Minsk, 1972, p 159.

3. "Normy amortizatsionnykh otchisleniy po osnovnym fondam narodnogo khozyaystva SSSR" [Amortization Deduction Norms for Fixed Capital in the USSR National Economy], Moscow, 1974, p 28.
4. Calculations based on scrapping documents of the Vladimir Tractor Plant for 1977-1979.
5. V.K. Senchagov, V.V. Ostapenko and V.A. Milyayev, "Amortizatsionnyy fond v usloviyakh intensivifikatsii proizvodstva" [The Amortization Fund under Conditions of Production Intensification], Moscow, 1979, p 128.
6. According to the calculations of D.M. Palterovich, the inventory of metal-cutting machinery had reached about 3.8 million units at the end of 1972. At the existing growth rate there will be about 6 million units in the national economy in 10 years and approximately 8 million in 20 years. In order to keep them running for 1.5 shifts, 12 million machine-tool operators, not counting adjusters and repairmen, will be needed. (VOPROSY EKONOMIKI, No 11, 1973, p 53).
7. PLANOVOYE KHOZYAYSTVO, No 5, 1978, p 64.
8. PLANOVOYE KHOZYAYSTVO, No 4, 1978, p 68.

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## CAPITAL INVESTMENT, BUDGET AND FINANCE

### PRICE INCENTIVE TO IMPROVE QUALITY DISCUSSED

Kiev EKONOMIKA SOVETSKOY UKRAINY in Russian No 10, Oct 80 pp 35-40

[Article by T. Alferova, candidate of economic sciences]

[Text] The decree of the CPSU Central Committee and USSR Council of Ministers entitled "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality" has set the task of "raising the level of planning and economic performance, to bring them into conformity with the requirements of the present stage—the stage of advanced socialism, to raise considerably the efficiency of social production and to speed up scientific-technical progress and the rise of labor productivity, to improve product quality...."

In this context a great deal of work has recently been done to further improve the pricing of new technology in order to strengthen the relationship between the price and the efficiency of new technology. The theoretical substantiation of simultaneous reckoning of costs and efficiency of new technology and its application in pricing practice have made it possible to eliminate various methods of determining the economic benefit in which this indicator would be determined in pricing by the size of the difference between the upper and lower price limits (benefit for distribution), while in computation of the efficiency of capital investments and of new technology it would be determined by the difference of the imputed costs (annual economic benefit). In economic practice it has been a specific adverse consequence of this situation that computation of the size of bonuses for creators of new technology is made dependent upon the annual economic benefit, while the amount of profit going for material incentive purposes has been built up in the pricing process so as to take into account the benefit for distribution. These indicators have not been sufficiently linked to one another, and in a number of cases they have contradicted one another. Since the incompatibility of the procedures used has reduced the role of prices as an incentive, it has now been deemed advisable to take the annual economic benefit calculated in accordance with the "Method of Determining the Economic Efficiency of Using New Technology, Inventions and Innovative Proposals in the National Economy" in setting prices of new products for production and technical purposes.

In all industries producing products for production and technical purposes a system of supplements to wholesale prices is applied to highly efficient new products. In the form of additional profit the incentive supplements to wholesale prices are applied to new series-produced products on the basis of the economic benefit attained and to products certified in the superior-quality category. The economic benefit accruing in the national economy from use of the new technology is the source of the incentive supplements.

Supplements based on economic efficiency and product quality create additional profit of associations and enterprises, which replenishes incentive funds.

In order to speed up scientific-technical progress and to enhance the material motivation of all participants in creating new technology the incentive supplements are credited as follows: in associations and enterprises--to the fund for material stimulation of efforts to create new technology, put it into production and apply it (these deductions are strictly earmarked for bonuses to personnel directly involved in the creation and application of new technology); in scientific-technical organizations, project planning and drafting organizations and process engineering organizations--to the material incentive fund and the fund for social welfare and cultural programs and housing construction.

The proportion in which the additional profit accruing from supplements to wholesale prices in the sale of highly efficient new products and products bearing the state Quality Emblem is clearly stated at the present time. Economic incentive funds of production associations (enterprises) and scientific research, project planning and design and process engineering organizations are to receive 70 percent of it, while the remainder is equally distributed between the industry's unified fund for development of science and technology and the state budget.

Since additional outlays to create new machines and machinery and the return from their use are ordinarily separated from one another in place and time, the proportions in which the economic benefit shall be distributed between the sphere in which the technology is produced and that in which it is consumed constitute an important procedural and practical issue in economic stimulation of highly efficient products through the setting of wholesale prices.

The methods long in use for setting supplements to prices were based on the provision of equal distribution of the benefit among spheres and allowed 50 percent of the benefit to be used for this purpose. At the present time as much as 70 percent of the annual economic benefit may be used for incentive supplements, which considerably strengthens the role of prices as an incentive.

A comparative analysis of the size of incentive supplements when the economic benefit from creation and application of a series of machines is computed by the former method\* and by the new method\*\* demonstrates the appreciable advantages of the latter. An essential influence is exerted here by the fact that the size of the supplements to the wholesale prices for highly efficient new products is now confined to the range between 0.5 and 1.25 if the standard profit rate is taken as unity, whereas the previous range was from 0.2 to 1.0 (see the table).

Comparison of the Results of Determining the Additional Profit in the Form of the Supplement to Prices of Highly Efficient Machines and Equipment

	Types of Machines and Equipment					
	Stand for Di- agnosis of Re- friger- ation Units	Equipment for Manu- facturing Jewelry	Auto- matic Chuck (elek- troder- zhatel')	DSA-100 Deaera- tion Column	TG-1020- VI Trans- former	NVS Pump
Wholesale price, in rubles	384.0	3,600.0	10.2	839.0	24.1	580.0
Standard rate of profit, in per- centage of pro- duction costs	12.0	14.0	20.0	15.0	15.0	15.0
First variant:						
Benefit for distribution, in rubles	271.8	2,128.0	25.6	5,397.0	4.9	866.1
Relation of supplement to standard rate of profit, in percentage	60.0	50.0	100.0	100.0	20.0	70.0

\* "Metodika opredeleniya optovykh tsen na novuyu produktsiyu proizvodstvenno-tekhnicheskogo naznacheniya" [Method of Determining Wholesale Prices of New Products for Production and Technical Purposes], Moscow, 1960, pp 10-15.

\*\* "Ukazaniya o poryadke ustanovleniya pooshchritel'nykh nadbavok k optovym tsenam na novuyu vysokoeffektivnuyu produktsiyu proizvodstvenno-tekhnicheskogo naznacheniya i skidok s optovykh tsen po produktsii vtoroy kategorii kachestva, a takzhe po produktsii, kotoraya v ustanovlennyy srok ne attestovana" [Instructions on Procedures for Setting Incentive Supplements to Wholesale Prices for Highly Efficient New Products for Production and Technical Purposes and Deductions From Wholesale Prices for Products in the Second-Quality Category and Also for Products Which Have Not Been Certified Within the Allowed Period], Moscow, 1979.

Table (continued)

	<u>Stand for Di- agnosis of Re- friger- ation Units</u>	<u>Equipment for Manu- facturing Jewelry</u>	<u>Auto- matic Chuck (elek- troder- zhatel')</u>	<u>DSA-100 Deaera- tion Column</u>	<u>TG-1020- VI Trans- former</u>	<u>NVS Pump</u>
Absolute amount of profit from the supple- ment, in ru- bles	24.7	221.0	1.7	110.0	0.6	56.8
Second variant: Annual eco- nomic bene- fit, in ru- bles	956.5	28,600.0	27.0	3,522.0	7.01	749.0
Relation of the supple- ment to the standard rate of profit, in percentage: For reach- ing the lower limit of the in- terval	125.0	125.0	125.0	125.0	50.0	81.0
For each unit within the in- terval	--	--	--	--	1.2	4.2
Absolute amount of profit from the supple- ment, in ru- bles	51.4	552.6	2.1	136.8	1.6	65.1

As we see from the table, the methods of determining supplements to whole-sale prices in effect at the present time ensure that enterprises producing



the same output receive a considerably larger amount of profit for economic incentive funds than before.

We should note in this connection that even in cases when the absolute amount of the benefit for distribution exceeds the annual economic benefit, a comparison of the incentive supplements allows us to conclude that there are advantages to using the indicator of the annual economic benefit in the calculations. For example, the amount of profit from the supplement to the wholesale price of the DSA-100 deaeration column can increase 24 percent, while that pertaining to the wholesale price of the NVS pump can increase 15.2 percent.

It is important to note that the preferential procedure for distribution of profit accruing from the supplements (up to 70 percent of the amount is distributed to economic incentive funds) is now being extended to profit obtained both from supplements to wholesale prices of products bearing the state Quality Emblem and also profit from supplements based on efficiency. This also broadens opportunities for economic incentives and considerably enhances industry's motivation to manufacture such products.

Further elaboration of the principles of differentiation of levels of supplements by groups of products is a complicated aspect of the method of determining incentive supplements for efficiency and for product quality, since, as S. G. Strumilin, member of the academy, has pointed out, "arbitrarily different 'supplements' and 'deductions' in the prices of different products as compared to the labor expenditures embodied in the product unquestionably carry a threat of disproportions."\*

Experience in differentiating incentive supplements as a function of the benefit for distribution and relationships between indicators participating in its computation has demonstrated that the intervals of the relations adopted in the standard "scale," which fluctuated unevenly from group to group within the limits from 0.09 to 0.3, were not sound enough. Taking into account that the size of the incentive supplements increased uniformly from the interval of one group to another (by 10 percent), the incentive benefit of the supplements did differ essentially and unjustifiably from group to group, changing considerably for every unit within the particular group interval. For instance, in the interval created by the ratios 1.31-1.40, 1.1 percent of the supplement accrues for every unit within the interval, while in the higher interval created by the ratios 2.61-3.00, where one might expect a larger supplement, it is only 0.33 percent.

The approach now recommended to differentiation of the supplements as a function of relations between the economic benefit (E) and the wholesale price of the new product ( $T_{op}$ ) is more sound, since it makes it possible

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\* "Aktual'nyye problemy ekonomicheskoy nauki v trudakh S. G. Strumilina" [Current Problems of Economic Science in the Writings of S. G. Strumilin], Moscow, 1977, p 62.

to compare more accurately society's costs with the return obtained in the manufacture and use of the product. Moreover, the new scale makes it possible to delimit more clearly the size of incentive supplements as the ratio  $E/T_{op}$  changes, ensuring that they increase substantially for each unit within the interval. For instance, when the ratio  $E/T_{op}$  is in the 15-35 range, the size of the incentive supplement for each unit within the interval is 0.2 percent of standard profit, and when the ratio  $E/T_{op}$  is in the range 155-175, it is 0.85 percent, i.e., fourfold larger.

Enhancement of the incentive role of prices is now being achieved by increasing by 1.5-fold the size of these supplements to wholesale prices for highly efficient new products and for products which have been awarded the state Quality Emblem when production of these products is based on developments duly recognized as discoveries and inventions. The decree of the CPSU Central Committee and USSR Council of Ministers on further improvement of the economic mechanism points up the need to develop in the 11th Five-Year Plan the initiative of work collectives to make the transition to formation of economic incentive funds at stable rates set depending on the quality indicators of performance of associations and enterprises assigned in the plan. To be specific, it is recommended that higher rates be established for formation of economic incentive funds for production subdivisions which substantially augment the output of highly efficient new products for production and technical purposes and new consumer goods.

Beginning in 1976 indicators of the growth of production of products in the superior-quality category and of reduction of the share of outdated products which do not meet present-day requirements have been set in the plans of industrial ministries and departments. Enterprises with a higher share of marketed output in the superior-quality category which have been augmenting the output of products bearing the Quality Emblem more rapidly were given advantages. In order to make the incentive supplements more effective essential changes have been made in the procedure for establishing them and in the periods they remain in effect. On the one hand the approach to setting the period of the supplements has become more rigid, while on the other the periods of their validity have been substantially differentiated, and conditions have been clearly stipulated as to the use of the different periods of validity of the supplements, which makes it possible for enterprises operating efficiently to enjoy the benefits they are entitled to for a longer time.

Previously the period of validity of incentive supplements when a product for production and technical purposes was awarded the state Quality Emblem was limited to 3 years. Subsequent guidelines and instructions allowed the supplements to be awarded for up to 1 year for efficiency and quality and up to 2 years on products of particular complexity. But if during that time the product is awarded the state Quality Emblem, the validity of this supplement is extended without changing its size. The total period of validity of the supplement may be extended to 4 years, and for a product of particular complexity--to 5 years.

Thus on the whole more favorable conditions have been created for prolonged use of the supplements. This is especially important since, as experience has shown, the shorter periods of validity of the supplements previously in effect did not allow for a substantial increase in the volume of output of products bearing the state Quality Emblem to occur in that period, and that substantially diminished the incentive function of these supplements.

At the same time there is a need to note the difficulties which arise when the recommended procedure is used to determine the length of the period of validity of the supplements. This applies above all to establishing the periods of validity of supplements for products of particular complexity. The vagueness of the term "product of particular complexity" is giving rise to certain difficulties in effective use of the procedure that applies to it in establishing the period of validity of the supplement. In order to avert possible errors, when the length of the period of validity of a supplement is being determined and when the procedure is specifically set forth for determination of this period by agencies of the State Committee for Standards and technical administrations of ministries and departments, it would obviously be advisable to issue specific clarifications on this issue.

Since the industrial sector has already acquired a great deal of practical experience in certifying products with the state Quality Emblem, it has become necessary to specifically stipulate the procedure for establishing supplements when products are put in the superior-quality category upon resubmittal for certification. Accordingly, provision has now been made that when a product is awarded the state Quality Emblem upon resubmittal for certification, the incentive supplement and transfers to economic incentive funds are retained in the same proportion provided the product's technical and economic parameters have improved. If the parameters have not improved, the size of the supplement and the period of its validity are reduced by half.

The tasks of speeding up technical progress require that constant attention be paid to the problems of economic stimulation of the creation of highly efficient new technology and of putting it into production and, in particular, to the problem of discouraging (using the price mechanism) the manufacture of outdated products, to the problem of speeding up their withdrawal from production. In recent years the practice of applying deductions from wholesale prices of outdated products has spread to some extent, but the scale of this effort is manifestly inadequate even now. Among the causes of this situation we must include the fact that the methods of establishing the deductions are imperfect and that industries do not clearly plan the effort to certify products in all three quality categories.

Recent instructions have stated in specific terms the procedure for applying deductions from wholesale prices to products in the second-quality category and also to products which have not been certified within the allowed period: it is recommended that a deduction of 50 percent of total profit

obtained from the sale of this product be applied. At the end of the period for withdrawal from production of the product in the second-quality category, the reductions from the wholesale price are set in the proportion of the entire amount of profit. But there is a need for further improvement of the methods of establishing the deductions, since experience in their application demonstrates that these economic sanctions are not effective enough.

It is well known that products which are obsolescent and have been manufactured by enterprises for a long time go into the second-quality category. Experience has shown that as a rule products which have long been in production are highly profitable. In many cases the actual profit rate in the 4th or 5th year of its manufacture exceeds the assigned standard twofold or even more. For example, the actual profitability of many types of tools to which a standard rate of 17 percent of production cost applies reaches 30-50 percent in the 4th or 5th year of production. Given this high profitability, the use of economic sanctions in the amounts indicated above in the form of deductions from the wholesale price on outdated products does not have any essential impact on the economics of enterprises manufacturing them, since in many cases it allows them to obtain profit at the level of the standard rate.

The earning of profit at the level of the standard rate cannot by any means be regarded as an economic penalty. In our view it is more sound to establish reductions large enough so that the profitability of the given product does not exceed half of the assigned standard rate. This would result in unconditional draining off of sizable amounts of profit, would diminish the motivation of enterprises to manufacture outdated products, and would correspondingly increase the motivation to put highly efficient new technology into production. In this area it would obviously be advisable to make broader use of the experience of a number of CEMA member countries in applying penalties for production of products in a low-quality category. For instance, in Czechoslovakia when a product is for the first time put in the third-quality category a reduction of 5 percent of the wholesale price in effect is applied, and if on resubmittal for certification the product is assigned to the third category, the size of the deduction increases to 20 percent of the wholesale price.

Materials intensiveness, as we know, is one of the indicators of product quality.

A number of interrelated measures have been provided for in the pricing field in order to increase the motivation of production associations (enterprises) to make better use of material resources and to conserve them. For instance, when cheaper types of materials are used in production and product quality is at the same time maintained at the previous level, it would be wise for wholesale prices to be left unchanged to the end of the 5-year period. It is recommended that wholesale prices be set on products with lower materials intensiveness so as to take into account maintaining



the proportion of profit obtained from sales of the product previously manufactured.

In addition, under a specific decision of the USSR State Committee for Prices, when prices are set on new or modernized products for production and technical purposes which are equivalent to or exceed the products they replace in their technical and economic parameters and quality, and when relatively cheaper materials and substitutes are used in their manufacture, a higher profitability is provided for. Incentive supplements are established on products with lower materials intensiveness and energy intensiveness in the amount of up to 50 percent of the saving achieved in their production.

In order to economically stimulate enterprises to reduce the materials intensiveness of products it is recommended that the wholesale prices adopted in the plan for the product being replaced be used to determine the volume of output and labor productivity up to the end of the 5-year period and that the proportion of profit obtained from sale of the product previously manufactured be retained. Adoption of the normative net output indicator in planning practice is also helping to reduce the materials intensiveness of products; this indicator includes the wage (the base wage and the wage supplement) of production personnel as well as deductions for social security and standard profit. The normative net output indicator will now be used to determine the dynamic behavior of the volume of output, to calculate the labor productivity indicator, and to plan the wage fund, and deductions paid into the unified fund for development of science and technology will be made in percentages of the volume of normative net output.

But the "Instructions on Methods of Elaborating the (Normative) Net Output Indicator and of Applying It in Planning" provide that the supplement and additional payment for changing the cost of materials and components are not to be included in the standards of net output, which detracts from the role of these supplements as an incentive and comes into contradiction with the recommendations for stimulating reduction of materials intensiveness by using the price mechanism. It is advisable to bring the documents mentioned above into line with one another, which will promote a strengthening of the interaction of price methods and other methods of economic stimulation of product quality.

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## UTILIZATION OF RESOURCES AND SUPPLY

### CONTINUOUS PACKING MATERIALS SHORTAGES PLAGUE INDUSTRY

Moscow MATERIAL'NO-TEKHNICHESKOYE SNABZHENIYE in Russian No 11, Nov 80 pp 63-67

[Article by V. Vinokurov, deputy chief of Soyuzglavtary, and S. Svishchev, chief of a department of the All-Union Scientific Research and Experimental Design Institute of Containers and Packaging: "By Means of Intensification"]

#### [Text] Needs and Potentials

The packaging service of the country is a large consumer of material resources. In the USSR 28 million  $m^3$  of wood, 800,000 tons of rolled ferrous metal products, more than 1 million tons of packaging cardboard and a large amount of paper are used annually for packaging. The amounts of consumed materials can be reduced considerably, and first of all by increasing the intensification of the use of packing material.

During the 10th Five-Year Plan much attention was devoted to this trend. The pattern of the production and consumption of transport packing material was improved by increasing the proportion of cardboard boxes, paper bags, reusable packing material, wound cardboard drums and packing material made from polymeric materials with the corresponding decrease of the proportion of bulky material-consuming, inefficient wood packaging.

Coefficients of the effectiveness of replacement and interchangeability were worked out for determining the expediency of replacement. The former is characterized by the ratio of the adjusted expenditures on the production and use of the type of packing material being substituted to the type being replaced. If the coefficient is greater than one, replacement is economical, and vice versa. The latter shows the amount of released packing materials (or packaging) with the introduction of a new one. For example, with the replacement of wood boxes by cardboard boxes the coefficient of interchangeability of rough timber with corrugated cardboard is equal on the average to 15  $m^3$  per ton. The introduction of one ton of corrugated cardboard provides a saving of 10-11  $m^3$  of rough timber. The introduction of 1,000 wound cardboard drums in place of wood kegs and plywood drums releases more than 35  $m^3$  of rough timber.

When replacing one type of packaging with another it is necessary to take into account the geographic location of the production and consumption of the packaging, the transportation of empty packaging from the supplier, as well as the physical

properties of the packaging. Thin-wall wood packaging is used most efficiently when transporting products over long distances, for example, to regions of the Far North, from where its return is economically unsuitable due to the great transportation expenses, which exceed the cost of new packaging.

Reusable packing material is considerably more efficient as compared with nonreusable packing material. With the proper use and precise organization of collection a high turnover rate of packaging is achieved. For example, metal milk cans and wood boxes for wines and liqueurs make 50 turn-arounds a year, metal boxes for sausages—120, box trays for baked goods—180.

The choice of one packing material or another in each specific case depends on the properties of the product and the conditions of its sale. Thus, it is advisable to pack the products of mass production, which are sold within cities and large industrial centers, in reusable packaging. It is more advantageous to store and transport expensive cultural and personal goods—televisions, radios, tape recorders, refrigerators, sewing and washing machines—in inexpensive cardboard packaging or in a wood frame.

In the past 10 years some work has been done on improving the pattern of the production and consumption of transport packing material. In particular, the output of cardboard packaging increased 1.6-fold, wood box sets for reusable packaging—3.1-fold, wound cardboard drums—16.4-fold, paper bags—1.4-fold. The production of thin-wall wood boxes has been set up. As a result the proportion of commercial timber and lumber for the production of packaging decreased from 44.2 percent in 1970 to 29.5 percent in 1979.

However, the achieved increase of the output of economical types of packaging does not fully meet the needs of the national economy. The shortage of cardboard packaging alone last year came to 120,000 tons.

Why does this happen? The point is that in four years of the 10th Five-Year Plan the average annual increase of industrial production was 4.75 percent, while that of packing material was only 2.1 percent. Thus, the production of transport packing material and its consumption are being outstripped 2.3-fold by the growth of the output of industrial products. Moreover, during this period the growth rate of the output of economical cardboard packing material (as compared with the Ninth Five-Year Plan) decreased by more than one-half.

Why? The point is that the USSR Ministry of the Pulp and Paper Industry, the Ministry of the Timber and Wood Processing Industry and the Ministry of the Chemical Industry, which are responsible for providing the national economy with cardboard, wood and polymeric packing material are not taking the proper steps to develop its production. Therefore there is not enough transport packing material.

Due to its shortage, the unsatisfactory quality of production and the low organizational and technical level of transportation a considerable amount of cement, mineral fertilizers, vegetables and fruit and some other types of products is lost annually.

In order to meet more completely the need of the national economy for packaging and packing materials it is necessary to improve the structure of the packaging

balance. The production of reusable packaging, packing and corrugated cardboard, polymeric materials and boxes made from them should be increased. Effective substitutes for commercial lumber, particularly plywood and wood fiber boards, must be used more extensively.

Calculations show that the use of 1,000 m<sup>2</sup> of wood fiber board instead of boards when producing large packaging makes it possible to save 20-30 m<sup>3</sup> of rough timber. Moreover, wood fiber packaging reliably protects freight from moisture. With board casing an additional moisture-proof layer is necessary.

The development of the container transportation system, which promotes not only the speeding up of the delivery of freight and the improvement of the technical and economic indicators of the operation of transport, but also a significant decrease in the expenditure of materials for transport packing material and the introduction of packageless transportation of products and light-weight types of packaging has a substantial influence on the intensification of the packaging service.

It is possible to reduce the specific consumption of packing materials per unit of output being packed by enlarging the transport packing unit. Such an enlargement is accomplished with the use of heavy-freight boxes, specialized reusable box and post pallets. A significant freeing of packing materials and a saving of labor inputs are obtained with the transportation of cargo in packets.

A list of products subject to transportation in containers and transport packets has been approved by the USSR State Committee for Material and Technical Supply for the further improvement of packageless shipments. An extensive list of products and recommended types of containers are cited in the adopted document. The engineering characteristics of specialized containers are given in the appendix to the list. Meanwhile the development of container, packet and packageless freight transportation is being carried out slowly. For example, over a period of 15 years the USSR Ministry of the Construction Materials Industry has been introducing containers for transporting sheet window glass. But what is the result? Only about 60 percent of the output being produced is being transported by the advanced means. Due to the slow introduction of containers the enterprises of the glass industry of the USSR Ministry of the Construction Materials Industry annually use for packing glass more than 300,000 m<sup>3</sup> of lumber.

A way to decrease the consumption of lumber and further develop container, packet and packageless transportation is the extensive use of heat-shrinking film. Its use, in our opinion, is especially efficient in the chemical and food industries. Consequently, these sectors should create the necessary capacities for the packing of products.

It is time, in our opinion, to begin the centralized planning of the production of specialized containers. In this connection it is necessary to set specific assignments for all machine building ministries and to allocate the necessary capital investments. The implementation of the indicated measures will make it possible to improve the packaging balance considerably and to sharply reduce the consumption of lumber.



## From the Standardization of All-Union State Standards to the Standardization of Packaging

At present about 200 standards have been set for various types of packaging. Along with this a large number of sectorial standards and specifications for the packing of specific types of products are in effect. All these standard technical documents regulate the types and dimensions of packaging.

The state and sectorial standards are the main reference base of pricing, the standardization of the consumption of packaging and packing materials and the standardization of the type sizes of packaging. During the 10th Five-Year Plan packaging has been standardized in conformity with the requirements of All-Union State Standard 21140-75 "Packaging. A System of Dimensions." The standard is based on a module 800 X 1,200 mm, which corresponds to the size of a flat exchange pallet. Standardization according to a uniform module will create the necessary conditions for the extensive introduction of the packet transportation of freight and the universal mechanization of loading and unloading operations.

Due to the imperfection of the introductory section of the object standards many enterprises are using packaging for the wrong purpose. At present the introductory section of the majority of object standards has the following entry: "Boxes can be used for packing other products, if they ensure the safekeeping of these products." Such a wording is justified from the point of view of the reduction of the number of type sizes of packaging, the increase of its series production, standardization and interchangeability. However, from the point of view of economic efficiency this wording is not always justified. It gives the enterprise grounds for using boxes inefficiently. For example, the Cheboksary Electrical Equipment Plant of the Ministry of the Electrical Equipment Industry uses boxes for packing contractors which hold 130 kg of freight. In fact less than 40 kg are loaded into it. Such violations are also being committed by other enterprises.

In our opinion, the wording of the introductory section of the object standards should be as follows: "Boxes can be used for packing other products if they ensure their qualitative and quantitative safekeeping and if their use in this case is economically substantiated." The indicator of the comparative economic efficiency of the version of packaging and the means of packing, which characterizes the minimum adjusted expenditures on the packing of a unit of output, can serve as the criterion of substantiation.

It is also necessary to standardize the outside flaps of cardboard boxes. According to instructional All-Union State Standard 9142-77, the outside flaps can be butt or lap jointed. Calculations show that considerably more cardboard is used for the production of four-flapped cardboard boxes with lap-jointed outside flaps as compared with boxes having butt-jointed outside flaps. However, the state standards for cardboard boxes do not always regulate the version of outside flaps. What does this result in? In the fact that individual enterprises and organization, while preferring boxes with lap-jointed flaps, unjustifiably overstate the rates of consumption of cardboard.

The rational use of packing materials is an important direction of intensification. Let us cite an example. Several years ago the Engel's Combine of Chemical Fibers

imeni Leninskogo komsomola experienced a shortage of cardboard packaging. In order to improve the situation the combine proposed to manufacture boxes from new cardboard and the components for them from scraps of cardboard and returned boxes which were unsuitable for further use. But the laboratory of the State Inspectorate for Standards of Saratovskaya Oblast prohibited the Saratov Packaging Combine to produce boxes without components, citing All-Union State Standard 9481-76. Only after the intervention of the USSR State Committee for Material and Technical Supply and the corresponding clarification of the USSR State Committee for Standards was the packaging combine able to implement the valuable suggestion.

In our opinion, the state standards should not only permit, but also direct industrial enterprises and associations, ministries and departments to make extensive use of secondary packaging resources and scraps of packing materials.

Such a section of the standards as "Packing, Marking, Transporting and Storage" also has to be improved. At present the standards stipulate one or two means of packing products. And the means of packing is not always coordinated with the packaging resources. In our opinion, the standards should specify the different means of packing with allowance made for the conditions and distance of the transportation of products and the use of local resources. Moreover, it is necessary to provide for packageless and packet transportation with the use of general-purpose and specialized means of transportation, containers, box and post pallets, reusable and other advanced packing material. Such a differentiation of the means of packing in the standards for products will make it possible to improve significantly the use of packaging and packing materials.

#### Equalize the Standards

Technically sound standards are the reference base for the determination of the need of sectors for packaging and packing materials, for the drafting of plans of the production of packaging and the rational distribution of packaging resources. The elaboration and adoption of advanced, scientifically and technically sound rates of the consumption of packing materials make it possible to reduce by 3-5 percent the materials-output ratio of packing, without worsening its quality.

Attaching great importance to setting rates of the consumption of packaging and packing materials, the USSR State Committee for Material and Technical Supply compiled a coordinating plan of the elaboration and revision of the rates of consumption of lumber and cardboard. The plan has been submitted for the approval of more than 30 all-union and union republic ministries and departments. More than 70 sectorial scientific research organizations are participating in its implementation. As a result consolidated all-union and sectorial rates of the consumption of packing materials for the packing of more than 100 groups of products have been elaborated.

The great amount of work performed by the organizations of the Ministry of the Machine Tool and Tool Building Industry, the Ministry of Instrument Making, Automation Equipment and Control Systems, the Ministry of Tractor and Agricultural Machine Building and the Ministry of Construction, Road and Municipal Machine Building should be noted. Unfortunately, the USSR Ministry of Ferrous Metallurgy and the Ministry of the Electrical Equipment Industry are not displaying the proper activeness. For

example, in four years of the 10th Five-Year Plan the USSR Ministry of Ferrous Metallurgy has not elaborated a single standard among those stipulated by the coordinating plan, while the Ministry of the Electrical Equipment Industry has elaborated from the entire list only one item. The Ministry of Chemical and Petroleum Machine Building in practice has evaded participation in this important work. The Ministry of Machine Building for Light and Food Industry and Household Appliances, the Ministry of the Automotive Industry, the Ministry of the Chemical Industry, the Ministry of Machine Building for Animal Husbandry and Fodder Production and the Ministry of the Petroleum Refining and Petrochemical Industry are poorly monitoring the fulfillment of the coordinating plan.

A procedure for elaborating, coordinating and approving the rates of consumption of wood and cardboard transport packaging has been established for increasing the soundness of the rates of consumption and the responsibility of organizations. The USSR State Committee for Material and Technical Supply upon the representation of the ministries and with the approval of the All-Union Scientific Research and Experimental Design Institute of Containers and Packaging approved the all-union and sectorial standards. The plant standards are approved by the ministry (department) with the approval of the sectorial organization for packaging and the territorial organ of the USSR State Committee for Material and Technical Supply, in the region of whose activity the enterprise is located. Such a right, which has been granted for the first time to territorial organs, considerably enhances their executive and supervisory role for the rational and efficient use of resources of packaging.

The mandatory performance of the technical and economic substantiation of the rates and the determination of their relative and absolute decrease, the annual saving of packaging and packing materials is called for. It is recommended to perform all the work on improving the setting of rates on the basis of specific plans of organizational and technical measures.

Some sectors are already operating successfully according to such plans. For example, last year the Soyuzavtoelektropribor All-Union Production Association of the Ministry of the Automotive Industry jointly with the Scientific Research Experimental Institute of Automobile Electrical Equipment and Instruments compiled a consolidated plan on the saving of lumber and cardboard. Its fulfillment provided a saving of 4,000 m<sup>3</sup> of lumber and 180 tons of cardboard. The saving was achieved by the expansion of packageless shipments, the use of specialized reusable containers instead of box packaging, the introduction of reusable packaging and polyethylene film, the change of the design and dimensions of cardboard boxes and consumer boxes and the improvement of the cutting of corrugated cardboard.

To increase the procedural level of norm setting the USSR State Committee for Material and Technical Supply approved a method of elaborating individual and consolidated norms. The methods of calculating the rates of consumption of lumber, wood barrels and cardboard transport packaging for all levels of planning—from the enterprises to the USSR State Committee for Material and Technical Supply and USSR Gosplan—are given in it, along with the determination and classification of the rates.

The role of the mechanization and automation of the calculation of norms in the matter of improving norm setting is enormous. The All-Union Scientific Research and



Experimental Design Institute of Containers and Packaging developed and tested a model of the calculation of the rates of consumption of materials for the packing of products using a Mir-2 computer. At present instructions are being drawn up for calculating the rates of consumption of materials for packing products using computers.

#### By Joint Efforts

An important factor in the intensification of the packaging service is the increase of the reuse of packaging. During the past decade considerable work has been done by the USSR State Committee for Material and Technical Supply. More than 200 packaging repair enterprises have been built and renovated. This made it possible to increase 1.4-fold the volume of the use of returned packaging. At present more than one-third of the need for wood and cardboard transport packaging is met by its reuse. Last year alone 180,000 hectares of forest were saved by the turnover of 28.1 million m<sup>3</sup> of returned wood and cardboard packaging.

The organizational and legal conditions of the use of returned packaging are regulated by the instructions on the procedure of turning over, returning and reusing wood and cardboard packaging, which were approved by the USSR State Committee for Material and Technical Supply. The instructions establish the procedure of planning, accounting and reporting, as well as a system of calculations for returned packaging and the procedure of turning over, returning and accepting packaging.

It should be taken into account that packaging is reused efficiently only when the expenditures on its gathering, repair and return do not exceed the cost of new packaging. Therefore the territorial organs of the USSR State Committee for Material and Technical Supply jointly with enterprises of industry and trade must strive to the utmost to use returned packaging locally for the packing of the products turned out in the regions and to reduce its long-distance transportation in every possible way.

In order to organize the reuse of returned packaging the USSR State Committee for Material and Technical Supply set up a network of packaging-collecting and packaging repair enterprises. However, the technical level of packaging repair enterprises is extremely low. Manual labor predominates in the repair of wood and cardboard packaging. Apart from the All-Union Scientific Research and Experimental Design Institute of Containers and Packaging, no one is engaged in the production of specialized equipment for the repair of packaging. Packaging repair enterprises are experiencing a great shortage of specialized motor transport and loading and unloading equipment.

At present two forms of the supply of transport packaging, centralized and decentralized, are in effect. The centralized supply of packaging is carried out through the ministries and departments, while its decentralized supply is carried out through the territorial organs of the system of the USSR State Committee for Material and Technical Supply. Practice has shown the advantages of the decentralized supply of packaging and packing materials. The direct link of territorial organs with consumers gives a complete picture of affairs locally, which is not always achieved in the case of centralized supply. Having considerable reserves of packaging, the territorial organs easily manipulate them with allowance made for the arising need.



At the same time without the active participation of ministries and departments the USSR State Committee for Material and Technical Supply and its territorial organs cannot develop the capacities for increasing the production of packaging, introduce packageless, container and packet transportation of products and accomplish the further concentration and specialization of the production of packaging. Large capital investments are needed here. Having transferred the functions of supplying enterprises with packaging to the organs of the USSR State Committee for Material and Technical Supply, the ministries and departments withdrew from the solution of this important national economic question. As a result during the years of the Ninth Five-Year Plan and four years of the 10th Five-Year Plan they virtually did not increase the production volumes of transport packaging even for meeting the needs of their own enterprises. For example, the USSR Ministry of the Food Industry, which consumes more than 50 percent of the cardboard packaging, and the USSR Ministry of the Fish Industry, which consumes more than 25 percent, did not worry about increasing the output of cardboard boxes.

It is impossible to consider as normal the situation in which capital investments for developing the production of packaging are allocated to the ministries and departments which consume the packaging, while the USSR State Committee for Material and Technical Supply bears the responsibility for supplying the national economy with packaging. The following solution occurs to us. So far a specialized sector has not been created. In order to improve the supply of the national economy with packaging it is necessary to combine sectorial and territorial supply. The capital for packaging and packing materials should be allocated to the ministries and departments. Such a procedure will enable the USSR State Committee for Material and Technical Supply jointly with the ministries and departments to work out more effectively the current and long-term development of the production of packaging. The questions of the effective supply of enterprises with packaging according to the allocated capital should be entrusted to the territorial organs of the USSR State Committee for Material and Technical Supply.

The poor provision of specialized materials to packaging enterprises is arousing particular anxiety. The USSR Ministry of the Timber and Wood Processing Industry is not setting up their production. In order to stimulate the production of packing materials of the appropriate thicknesses it is necessary to improve the system of planning of the production of packing lumber, utilizing for this the corresponding effectiveness ratios and differentiated prices. It also seems expedient to carry out the planning and delivery of plywood for packaging not in cubic meters, but in the form of parts of boxes. This will enable plywood plants to use the reserves of plywood completely.

The implementation of the indicated measures will undoubtedly improve the supply of the national economy with packaging, will ensure the safety of the products being transported, as well as will increase the efficiency of the use of material and manpower resources in the packaging service.

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## ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

### COMPUTER USE FOR INTERSECTORIAL BALANCE DESCRIBED

Moscow VESTNIK STATISTIKI in Russian No 11, Nov 80 pp 41-47

[Article by V. Vokk and M. Fidler: "Experience With Computer Processing of Accounting [Ex-Post] Intersectorial Balances"]

[Text] In the accounting [ex-post] intersectorial balances of the production and distribution of gross social product prepared by the statistical organs the interrelation between sectors is expressed as an interrelationship between pure sectors. Pure sectors, as groups of products, do not correspond to the sectors—as aggregates of enterprises—which are supervised by the economic management organs. Planning is conducted for addressible recipients—that is, in a departmental framework. Hence planning and management organs are interested in the receipt of accounting data on the linkages between ministries with respect to the production and consumption of output.

Data in such a framework cannot be obtained from the existing statistical accounting system. They could be obtained, however, if the materials of the one-time surveys conducted for the compilation of the accounting intersectorial balances were to be utilized more fully.

As a result of such surveys the statistical organs receive from enterprises a "Report for the one-time calculation of inputs for the production of output, in monetary terms, for the year..." (Form No 1). On the basis of the data in the Form No 1 report, accounting intersectorial balances in the pure-sector framework are prepared. These reports also contain an address part which lists the specifics of enterprises: the name of the enterprise, the ministry (department) to which it is subordinated, and the sector of industry (management sector) to which it is attributed.\*

A full utilization of all the information in the Form No 1 reports will make it possible to construct tables characterizing the linkages in the production and consumption of output between pure sectors and management sectors of industry, between pure industrial sectors and ministries.

The construction of tables of the production and consumption of industrial output by the enterprises included in the corresponding ministries and departments, which

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\*The Form No 1 report under consideration here is that which is submitted by industrial enterprises.

we proposed in the context of task-setting for the complex of electronic information processing for the construction of an accounting intersectorial balance at the union-republic level, will provide the following characteristics for each ministry (department):

Table 1. Production of gross industrial output by management sectors of the ministry in a pure-sector breakdown.

Table 2. Consumption of the output of pure sectors by the management sectors of the ministry.

Table 3. Components of the value of the gross output of management sectors of the ministry.

Data in Table 1 are shown at the enterprise wholesale prices valid in the year under review, those in Table 2 at final user prices, and the data in Table 3 on the volume of gross output at enterprise wholesale prices valid in the year under review in a breakdown by value components.

On the basis of these tables for each ministry one can compute the structure of the production of pure sectors in the output of the management sector and the structure of the production of the output of a pure sector in the management sectors of a ministry, the shares of the output of management and pure sectors in the total volume of gross output of a ministry, the number of management sectors in which output of a pure sector is produced and the number of pure sectors (product groups) in the output of a management sector; the structure of the consumption of output of pure sectors for each management sector and the structure of the consumption of the output of each pure sector for all management sectors of the ministry, the shares of value components in the gross output of each management sector and the shares of each value component of the gross output of each management sector in the total of the management sectors of a ministry, the coefficients of direct material inputs of pure sectors products per unit of gross output of a management sector.

The data received for each separate ministry can be aggregated (in the case of a union-republic) into groupings of all-union, union-republican and republican ministries, and also for the territory as a whole. From these consolidated data a still larger collection of analytical indicators can be computed, with ministry addresses: structural characteristics of the production of gross output in management sectors with a breakdown by pure sectors for all ministries (by groups of ministries); the same type of characteristics computed for the aggregate of all ministries jointly; structural characteristics of the consumption of the output of pure sectors by ministries; shares of the value components of gross output in a framework of ministries; coefficients of direct material inputs of the output of pure sectors per unit of gross output produced in the enterprises belonging to a given ministry, and some others.

The initial information for the compilation of accounting intersectorial balances can in practice be given additional processing if its entire processing is transferred to the computer. This work has first been implemented in the USSR by the

TsSU [Central Statistical Administration] of the Estonian SSR in the preparation of the accounting intersectorial balance for 1977. The entire base information for the Estonian SSR industry (Form No 1 reports) was processed on the ES [Unified System] computers [i.e., the RTAD system], which provided the possibility:

--to shorten the compilation period for consolidated reports on management sectors on the basis of the materials of the one-time survey of outlays on the production of output in industrial enterprises for submission to the USSR Central Statistical Administration;

--to obtain a computerized "industry" block of the accounting intersectorial balance of the production and distribution of output in the union-republic;

--to shorten the processing periods and ease the work on the balancing of the republican intersectorial accounting balance;

--to obtain a set of tables of the production and consumption of industrial output for ministries and departments;

--to carry out with the aid of the ES computers all analytical computations for the accounting intersectorial balance and for tabulations in a breakdown by ministries;

--to establish the basis for annual balance preparations requiring the utilization of the information of an accounting intersectorial balance constructed under an expanded program.

In order to obtain such results, the Division for Statistics of Social Production Effectiveness and Proportionality of the USSR TsSU NII [Scientific Research Institute], together with the National Economic Balances Division of the Estonian SSR TsSU (under a mutual agreement on scientific-technical cooperation), have worked out the tasks indispensable for the compilation and analysis of accounting intersectorial balances of the production and distribution of output in the economy of a republic; on the basis of these tasks a set of programs for the ES computers has been prepared by the Estonian SSR TsSU RVTs [Republic Computing Center].

This work has permitted the first submission to planning and management organs of the republic not only of an accounting intersectorial balance and of analytical computations based on it, but also of data in a ministerial breakdown with analytical computations.

As an example we show fragments of Tables 1, 2, 3, 4, 5 and 6 (see below) for the USSR Ministry of Power and Electrification (for enterprises situated on the territory of the Estonian SSR), giving indicators of the analytical computations. The availability of data in value terms for each ministry (department), on the basis of which the analytical indicators were computed, permits their aggregation by groups of ministries (departments) and into totals for the republic as a whole, and on the basis of these aggregates the computation of the corresponding analytical indicators for the groups of ministries and the republic as a whole. These indicators are analogous to those for each separate ministry, and beyond



that they can be presented in a breakdown by ministry (department) and can also reflect the interconnections of management sectors and pure sectors for all ministries as a whole. Provision has been made in the task formulations for the calculation of the aggregates by groups of ministries and the analytical computations based on them, and programs for the computer processing have been included in the overall complex.

Table 1. Structure of the Output of Management Sectors by Pure Sector Products (Product Groups) and Structure of Pure Sector Output by Management Sectors in a Ministry (in percent)

Name of management sector	Name of pure sector [product group]							
	Electrical and thermal energy	Wiring products	Metal structures	Machine and equipment repair	Timber products	Precast concrete and concrete structures and products	Wall materials	Other construction materials
Thermal power stations	96.95 99.67	...	...	1.95 36.10	...	...	...	...
Electrical power networks	69.93 0.33	...	...	30.07 2.54	...	...	...	...
Repair of other industrial equipment and instruments	...	...	...	73.25 60.80	...	...	...	...
Precast concrete and concrete structure and products industry (exclusive of wall materials)	...	2.53 100.00	4.95 100.00	1.02 0.56	1.45 100.00	72.92 100.00	4.14 100.00	11.84 100.00

Note: In this table, two tables have been collapsed into one. For each management sector, the upper figures add up by row, the lower ones by column.

Table 2. Production of Output in an Enterprise of the Corresponding Ministry in a Breakdown by Management Sectors

<u>Name of management sector</u>	<u>Share of sector output in the total volume of gross output (in per-cent of total)</u>	<u>Number of pure sectors in the output of the management sector</u>
Thermal power stations	92.70	3
Electrical power networks	0.42	2
Repair of other industrial equipment and instruments	4.16	1
Precast concrete and concrete structure and products industry (exclusive of wall materials)	2.72	7
<u>Total for the ministry</u>	<u>100.00</u>	<u>10</u>

Table 3. Production of Output in an Enterprise of the Corresponding Ministry in a Breakdown by Pure Sectors

<u>Name of pure sector</u>	<u>Share of sector output in the total volume of gross output (in per-cent of the total)</u>	<u>Number of management sectors producing output of the given pure sector</u>
Electrical and thermal energy	90.18	2
Fuel shales	0.89	1
Wiring products	0.07	1
Metal structures	0.13	1
Machine and equipment repair	5.01	4
Timber products	0.04	1
Precast concrete and concrete structures and products	1.98	1
Wall materials	0.11	1
Other construction materials	0.32	1
Other sectors	1.27	1
<u>Total for the ministry</u>	<u>100.0</u>	<u>4</u>

Table 4. Structure of the Consumption of Management Sectors in Terms of Pure Sector Products and Structure of the Consumption of Pure Sector Products by Management Sectors in a Ministry (in percent)

Name of management sector	Name of pure sector							
	Electrical and thermal energy	Processed oil products	Fuel shales	Ferrous metals	Electro-technical industry products	Timber products	Cement	Other construction materials
Thermal power stations	0.07 7.80	7.74 89.07	86.30 99.98	0.48 12.84	0.68 46.56	0.05 14.76	0.01 0.63	0.05 10.86
Electrical power networks	0.00 0.00	43.49 8.48	0.90 0.02	0.98 0.44	13.54 15.62	0.64 2.98	0.07 0.10	0.23 0.83
Repair of other industrial equipment and instruments	2.62 13.85	3.80 1.81	0.00 0.00	37.91 41.94	13.18 37.19	7.14 81.60	1.38 4.67	3.92 34.48
Precast concrete and concrete structure and products industry (exclusive of wall materials)	13.28 78.35	1.22 0.64	0.00 0.00	36.43 44.78	0.20 0.63	0.05 0.66	25.20 94.60	5.50 53.83
Total for the ministry	0.70 100.00	7.86 100.00	78.16 100.00	3.39 100.00	1.33 100.00	0.33 100.00	1.11 100.00	0.43 100.00

Note: In this table, two tables have been collapsed into one. For each management sector, the upper figures add up by row, the lower ones by column.

Table 5. Structure of Value Components of Gross Output by Ministry Management Sectors (in percent)

Name of management sector	Value Components			Value of gross output at enterprise wholesale prices
	Total current material inputs	Depreciation	Other value components	
Thermal power stations	39.00 90.56	17.94 74.06	43.06 ...	100.00 92.70
Repair of other industrial equipment and instruments	35.97 3.75	4.35 0.81	59.68 ...	100.00 4.16
Precast concrete and concrete structure and products industry (exclusive of wall materials)	61.19 4.16	11.68 1.41	27.13 ...	100.00 2.72
Total for the ministry	39.92 ...	22.45 ...	37.63 ...	100.00 ...

Note: In this table, two tables have been collapsed into one. For each management sector, the upper figures add up by row, and the lower ones by column.

"Other value components" is broken down in the computations into the following elements: wages, basic and supplementary; deductions into social funds; other expenditures—total, of which: money payments to workers not included in the wage fund, other money expenditures, payment for work on current repair of equipment, payment of work executed by outside transport, payment of communication services, and other types of material expenditures. Together with the current material inputs and depreciation, these outlays express the cost of gross output. Further on the components of non-production outlays, the value of customers' materials, and also profits (+) and losses (-) are shown.



Table 6. Coefficients of Direct Current Material Inputs of the Output of Pure Sectors Per 1,000 Rubles of Gross Output of Management Sectors of a Ministry

Name of management sector	Name of pure sector							
	Electrical and thermal energy	Processed oil products	Fuel shales	Ferrous metals	Electro-technical industry products	Timber products	Cement	Other construction materials
Thermal power stations	0.237	30.142	336.537	1.873	2.662	0.208	0.030	0.199
Electrical power networks	...	627.087	12.947	14.140	195.230	9.199	1.022	3.322
Repair of other industrial equipment and instruments	9.371	13.652	...	136.339	47.400	25.680	4.976	14.086
Precast concrete and concrete structure and products industry (exclusive of wall materials)	81.170	7.394	...	222.926	1.237	0.319	154.215	33.670
Total for the ministry	2.814	31.370	312.026	13.522	5.301	1.309	4.428	1.699

The data are presented for the enterprises surveyed and were processed on the basis of Appendix A to the Form No 1 report, which appears to constitute a peculiarity of the construction of the accounting intersectorial balance in the Estonian SSR. For the compilation of tables in the ministry framework this particularity is of purely technical significance and in no way changes the methodology itself for their preparation on the basis of the Form No 1 reports.

On the basis of the initial data, totals were obtained for all indicators of the one-time accounting report for ministries in a management sector breakdown; a

correction was executed in order to exclude data on intra-trust turnover, which does not enter into the volume of gross output, for enterprises of the petroleum processing, milk, butter and cheese, and fishery industry sectors. After these transformations of the data, tables in the ministry framework were formed, analytical indicators were computed and the results obtained were printed out.

Such data permit the planning and management organs to evaluate the degree of specialization and combination of production by ministries (departments) and to analyze the dependency of input coefficients on the structure of output produced. This analysis will be more profound if the data of the accounting intersectorial balance, and in the first instance the direct current material input coefficients, are brought to bear on it. It is true that in the utilization of these coefficients in the analysis together with the same coefficients from our tables it must be kept in mind that the latter are calculated per unit of the value of gross output at enterprise wholesale prices while the coefficients from the accounting intersectorial balance of production and distribution of output are calculated per unit of the value of output at final user prices, i.e., a quantity which is larger than the wholesale price. In both cases the inputs are calculated on the same manner—at final user prices.

The results of such joint analysis may constitute an accounting basis in the elaboration of generalized norms for the sector and the ministry, for which the data of the accounting intersectorial balance cannot be utilized directly.

Such data can constitute an important help in norm-setting work at the present time in the context of the creation of the system of progressive technical and economic norms and standards by type of work and type of expenditures (economies) of labor, raw materials, materials, and fuel and energy resources, of utilization standards for productive capacities and specific capital investments, and of norms and standards for the determination of equipment and wiring product requirements, for which the preparation and confirmation procedures have recently been approved by the USSR Gosplan in accordance with the CPSU Central Committee and USSR Council of Ministers decree of 12 July 1979 "On Improving Planning and Strengthening the Influence of the Economic Mechanism on Increasing Production Efficiency and Work Quality."

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## ECONOMIC MODELING AND COMPUTER TECHNOLOGY APPLICATION

### TECHNICAL PROBLEMS OF COMPUTER USE REVEALED

Moscow VESTNIK STATISTIKI in Russian No 10, Oct 80 pp 32-38

[Article by V. Maksimenko: "Scientific and Technical Problems of the Application of Computer Technology"]

[Text] In the decree of the CPSU Central Committee "On the Further Improvement of the Economic Mechanism and the Tasks of Party and State Organs" (1979) it is noted that our economy has now reached that level of development where the further improvement of the management of the national economy is assuming particular urgency. The use of computers and automated control systems is making it possible to expedite the gathering, processing and obtaining of information, the drafting of different versions of plans and the finding of the optimal planning decisions and thereby to increase the efficiency of social production.

In contrast to the capitalist countries, in our country the unlimited opportunities to implement a systems approach are contributing to the creation and development of automated control systems. The planned nature of the creation of automated systems and the centralized management of the processes of their creation are making it possible to take thoroughly into account the general trends of technical progress and to select the most promising directions of automation. The utilization of the advantages of the socialist economic system has made it possible to achieve in a comparatively brief period appreciable gains in the development and introduction of automated control systems.

Certain experience in designing and introducing automated control systems and computer centers, as well as some experience in setting up multiple-user computer centers (KVTs's) and territorial collective-use computer centers (VTsKP's) has already been gained and the prospects of their further development are being examined.

The development of the use of computer hardware underwent a number of stages in our country. Initially—from 1954 to approximately 1965—computers were available at individual organizations and were used primarily for the purposes of these organizations. The enterprises which did not have their own computer hardware, had almost no access to computers.

In 1965-1970 services in the form of the use of computer time according to contracts and other forms of the joint operation of computers became widespread. Then, beginning in the 1970's, forms of the collective use of computers: multiple-user computer

centers, then collective-use computer centers, began to become widespread. Planning work was carried out on uniting the computer centers into a state network of computer centers (GSVTs).

The areas of the application of computer technology steadily increased. Whereas at first computers were used in only a few sectors of industry for facilitating accounting and expediting engineering calculations, now they are used everywhere for solving the widest range of problems. Today in our country problems of 375 classes in 60 sectors are being solved using computer hardware.

During the last three five-year plans 4,400 automated control systems were set up in the country. It should be noted that as automated control systems based on third generation computers are set up, a tendency toward an increase of the proportion of economic problems being solved is being observed. The experience gained attests to the great efficiency of automated control systems. The term of recovery of the assets, which are invested in the development of automated control systems for enterprises does not exceed, as a rule, 3-3.5 years, while automated control systems of technological processes (ASUTP's) in practice pay for themselves in 1-2 years.

At present the development of automated control systems for enterprises is proceeding on the basis of the Unified System of Computers and on the basis of sectorwide procedural guidance materials, standard, design and programming decisions.

A standard structure of automated control systems for enterprises according to the mandatory number of subsystems, as well as standard algorithms and design decisions (which were elaborated by a special scientific and technical commission) have been approved by the USSR State Committee for Science and Technology.

In complete form the automated control system for enterprises should consist of a ramified network of sensors and measuring devices, which are constantly linked with the computer center. Such a system ensures real-time operation and makes it possible to organize the flexible operational control of production. The location of sensors at the workplaces in shops, on units, at material warehouses and bases eliminates the intermediate circulation of paper or any other carriers of information. The data on the output of any product (in finished or intermediate form) and on the movement of physical assets are fed directly into the computer, are processed in conformity with the program and are released to management personnel for making decisions.

The economic efficiency of automated control systems for enterprises is formed mainly by means of the improvement of the planning of production and the increase of the level of operational management. The increase of the output of products on the basis of the rational use of production capacities, materials and manpower resources is ensured by means of this.

Integrated automated control systems (IASU's) are the result of the development and improvement of automated control systems for enterprises and automated control systems of technological processes and of their technical base. This is a new direction of the creation of automated control systems. At this stage of the state of computer technology integrated automated control systems can be formed in two ways.



The first direction consists in the grouping of the general-purpose computers which have been installed at the computer centers of automated control systems for enterprises with the control computers of automated control systems of technological processes. More precisely, it is the transfer (input) of a portion of the information from the automated control system of technological processes into the automated control system of the enterprise. In this case the installation of independent sensors for gathering the information of the automated control system for enterprises is partially eliminated. Coupling devices between the general-purpose and control computers are required for such an integrated automated control system. In the future when developing new models of control computers like the system of small computers their compatibility with the Unified System of Computers is called for.

The second direction is the combination of the functions of the automated control system for enterprises and the automated control system of technological processes in a single computer or a single computer center. In this case it is necessary to make a careful calculation and economic substantiation, since more powerful computers (as compared with the needs of the automated control system for enterprises) and the appropriate devices will be required for such a system.

The sectorial automated control system (OASU) at present is arranged in such a way that it can function both in the presence of automated control systems for enterprises and without them. It should ensure the most effective organization of production processes, the distribution and consumption of material resources within the given sector and at each enterprise and their interaction with other, related sectors of the national economy.

Given all the diversity and the specific nature of the problems, which are connected with the peculiarities of the technology of a specific sector and with its place in the process of social reproduction, the sectorial automated control systems have common traits, which make it possible to use a standard methodology and standard programs of the solution of a number of fundamental problems of planning and management. This circumstance considerably facilitates the further development and improvement of sectorial automated control systems.

The complexity of the structure of sectorial systems and of their software increases the average term of recovery of the expenditures on the creation of sectorial automated control systems. The greatest impact in these systems is achieved by the solution of optimization problems, which in turn requires the most complex software.

For the purpose of surmounting the difficulties of setting up sectorial automated control systems the USSR State Committee for Science and Technology adopted a decision on the standardization of subsystems (12 mandatory subsystems were approved) and uniform principles for setting up sectorial computer centers. Subsequently, as experience was gained and the software was developed, the number of subsystems increased.

The analysis of the operation of sectorial automated control systems (OASU's) shows that these systems are of great importance, improve the economy of the sector and have a beneficial influence on the improvement of planning and operational management.

However, there are shortcomings in the use of computer hardware and in the development of automated control systems. The aspiration of every enterprise and institution to have its own computers led and to this day often leads to the dispersal of computer hardware, the decrease of the workload of computers, the duplication of design operations and operations of the development of software. With such an approach the opportunities to automate control at numerous small and intermediate enterprises are also sharply restricted.

A realistic alternative to the existing approach is the combination of the collective and individual use of computer hardware within the framework and on the basis of the Statewide Automated System for the Collection and Processing of Data for Accounting, Planning and Management (OGAS), which is being set up in the country, and its technical base of the State Network of Computer Centers and the Statewide Network for Data Transmission.

The task of the Statewide Automated System for the Collection and Processing of Data for Accounting, Planning and Management is to unite all automated control systems--from the automated control systems for enterprises to the control systems of central functional organs--and thereby to ensure the effective cooperation of the organs of management of the national economy at all levels when solving problems of accounting, planning and management. Thus, the Statewide Automated System for the Collection and Processing of Data for Accounting, Planning and Management should unite the automated systems of USSR Gosplan and the Gosplans of the union republics, the automated systems of other central organs (the USSR Central Statistical Administration, Gossnab, the USSR State Bank and others), republic and territorial automated control systems, the automated control systems of ministries, departments, associations and enterprises. It is vitally important that the automated systems of all levels of management, while interacting within the Statewide Automated System for the Collection and Processing of Data for Accounting, Planning and Management, will ensure the solution of problems of an interdepartmental nature.

The central control of the activity of computer centers in a region is the most important means of increasing the efficiency of the use of computer centers. Such a service has been set up at the computer center of the statistical administration of Kiev.

For the purposes of increasing the effectiveness of the use of the computer hardware of operating computer centers the USSR State Committee for Science and Technology jointly with the USSR Central Statistical Administration assigned to the experimental control service of Kiev the fulfillment of the following main tasks: the identification of the idle time of computers, which is available at the computer centers of organizations, enterprises and institutions of the city; the determination of the needs of enterprises, organizations and institutions for computing and data processing operations with the use of computers; the organization of the use of the idle time of computers of the computer centers.

During 1977 about 120 enterprises and organizations, including 89 computer subdivisions, which are equipped with high- and intermediate-power computers, used the resources of the service. The given indicators of the economic effectiveness of the work of the control service attest that the total profit for the year from the increase of the amount of work of the computer centers was several hundred thousand

rubles, and it was obtained first of all due to the large workload of the computer hardware.

The calculation of the efficiency of the existing control service showed that its operation would make it possible to increase the effectiveness of the use of the computer resources of the computer centers of the region. The idle time of the computer pool decreased. A large reserve of unused computer time was identified; the elimination of this should become the main direction when solving the question of developing the control service and setting up an automated control service of the computer resources of the region. At the same time there are certain problems, the solution of which could improve the work of these services. Thus, the outlays connected with the operation of the control service fall as overhead entirely on the computer center of the statistical administration of the city, since the services offered to users are not paid for by the latter. Obviously, the need has arrived to introduce cost accounting principles in the relations between the users and the control service.

Right now such control services are being set up in a number of cities of the country, particularly Alma-Ata, Moscow and Tbilisi. In our opinion, it is advisable to set up control services as structural subdivisions of the territorial collective-use computer centers--a new and efficient form of the use of computer hardware.

What are the most important advantages of the collective use of computers in management? Let us indicate only a few of them. First of all, the organizational, technical and procedural unity of the automated control systems being set up makes it possible to utilize completely the advantages of the socialist system of management and the achievements of scientific and technical progress. The comprehensive use of computer equipment makes it possible to increase the workload of computers and to reduce the expenditures on the purchase of hardware, while the extensive application of highly productive computers makes it possible to reduce the cost of data processing. The opportunity will arise to automate the designing of systems, to expedite the design developments and to introduce centrally standard design decisions. The extensive circulation of software will make it possible to decrease the expenditures on automated control systems and to ensure the efficient use of the uniform all-union bank of algorithms and programs, the supply and operation of computer centers owing to the use of standard designs.

As is known, automated systems have been adopted so far only at large enterprises, where all the necessary and adequate conditions exist for the efficient use of computers: a large amount of information which is being processed, the coordination of the plans of the development of the sectors with the plans of the introduction of computer hardware, selectiveness in the meeting of the needs of various sectors for computer equipment, the availability of their own sources, financed purchases and the operation of computer hardware, the opportunity to concentrate efforts on the introduction of computers and, finally, the unity of the management and monitoring of the performance of operations on the introduction of computer hardware, the unity of stimuli and responsibility. With the increase of the scale of the use of computer hardware and with the appearance of large and superlarge computers the opportunities for the extensive introduction of computer hardware in the USSR are becoming limited, and this means is becoming inadvisable.



If the existing approach is retained, as the experience of designing shows, it is impossible to increase at all significantly the level of efficiency of automated control systems. There are even fewer opportunities, given the existing approach, to automate the main functions of management at small and intermediate enterprises. It should be taken into account that in our country there is an enormous network of enterprises, organizations and institutions which have been assigned to an independent balance sheet. Among them are a large number of different subdivisions whose main data processing and management functions should be automated. It is possible to solve the problem of automation on such a scale only by combining the collective and individual use of computers within the State Network of Computer Centers.

One of the most important and obvious advantages of the State Network of Computer Centers is the considerable decrease of the one-time capital outlays on the elaboration of automated control systems and of the current expenditures on their operation, as well as the sharp increase of the technical and economic indicators of the operation of enterprises, organizations and institutions. The unit expenditures on the creation of control systems, for which it is possible to disseminate extensively the practice of standard designing, are decreasing especially rapidly with the creation of the State Network of Computer Centers.

At the same time the expenditures on the use of the hardware of automated control systems are decreasing, especially with the changeover to the new YeS computer series (1978-1982). The average cost of processing a unit of data on these computers will be two-fifths as much as on existing YeS computers.

As the work front broadens, the proportion of the expenditures on designing will decrease, while the proportion for the purchase of computer equipment will increase. It is anticipated that the unit expenditures on designing, given the retention of the established procedure of development, in the foreseeable future will decrease by up to 40-50 percent of their current amount, while with the creation of the State Network of Computer Centers they will be decreased by up to 25-30 percent of this amount. The unit expenditures on the purchase of equipment will decrease more slowly, while for some items (programs, data transmission equipment, data carriers and terminals) they will, perhaps, even increase. But on the whole the expenditures on the processing of a unit of data will decrease substantially. A very appreciable saving can also be obtained as a result of the various organizational changes connected with the creation of the State Network of Computer Centers.

On the whole the unit expenditures on automated data processing as a result of the introduction of the State Network of Computer Centers should decrease, as was already indicated, by at least two-fifths. It is not difficult to understand what a great saving this will provide on the scale of the entire national economy as a whole. At present the amount of data is approximately  $10^{16}$  operations (in terms of computer operations). In the foreseeable future the annual increase of the processed amount of data might be 5.2-8.3 percent.<sup>1</sup> It will be advisable to automate on the average 70-80 percent of all data processing operations at management organs. The opportunity will arise to reduce considerably the amount of information which is processed in solving the current group of problems. It is well known that at the

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1. V. M. Glushkov, "Vvedeniye v ASU" [Introduction to Automated Control Systems], Kiev, 1973, p 13.



first stages of the introduction of an automated control system with the proper organization the amount of information decreases by 20-30 percent. Under the conditions of the State Network of Computer Centers the trends toward a reduction of the amount of information will decrease sharply: the opportunity will arise to standardize documents, to reduce the number of reporting forms, to rationalize the storage of information and, what is the main thing, to integrate data processing.

There are, it is true, grounds to assume that with the creation of the State Network of Computer Centers the total amount of processed information not only will not decrease, but will even increase, since the opportunity will arise to solve a large number of fundamentally new problems of an interdepartmental and intersectorial nature. The current outlays for the processing of the same amounts of data under the conditions of the State Network of Computer Centers will be one-half to one-fourth as much as at isolated centers and automated control systems.

A saving may also be obtained owing to the more extensive use of the uniform statewide bank of algorithms and programs, the standardization of the system of indicators and the introduction of a uniform system of the classification and coding of scientific and technical information, and also as a result of the automation of the keeping of classifiers and the calculation of prices, rates and standards. All this will make it possible to shorten the term of repayment of automated control systems.

In conclusion let us examine the organizational and technical measures of the development of automated control systems. As was already noted above, the publication during the Eighth and Ninth Five-Year Plans of sectorwide guidance materials was a great contribution to the strengthening of the procedural, informational and technical unity of the automated control systems being created. During the preparation of these materials the temporary procedures previously in effect for the development and introduction of automated control systems in machine building and instrument making were substantially revised and new sectorwide guidance materials were approved. At the same time the preparation of new procedural documents which take into account the experience of introducing automated control systems in 1971-1975 and the problems of introducing third generation computers was begun. The composition, content and procedure of performing the work on setting up sectorial automated control systems and automated control systems for enterprises were established.

One of the main directions in the area of the development and introduction of automated control systems is the creation of standard designs of the subsystems and standard design documents (the performance specifications, the engineering and working plans). It is well known that ministries and departments often develop their own automated control systems without regard for the available ready solutions. Specially organized commissions have selected the most acceptable solutions of the various subsystems of sectorial automated control systems and automated control systems for enterprises and have recommended them for universal application. In particular, standard design solutions of the subsystems of technical and economic planning, long-range planning, accounting, material and technical supply and other subsystems of automated control systems for enterprises have been approved. The use of these standard design solutions makes it possible to cut in half the period and cost of the development and introduction of sectorial automated control systems and automated control systems for enterprises.

Important work has been done on the setting of substantiated prices and rates for the work and services of cost accounting computer centers, a large number of other measures are being planned and worked out. At present collective-use computer centers, as a rule, are set up on the basis of the most developed computer center by further outfitting it with computer equipment, user stations and other terminal equipment. The administrative subordination of the center in this case does not change. The users lease from the collective-use computer centers the terminal equipment--the user stations. The maintenance of this equipment is also performed by the collective-use computer centers. Multiple-user computer centers and the individual computer centers of enterprises, which, along with solving problems on their own computers, can use the capacities of collective-use computer centers for solving complicated problems and for alleviating the peak computer loads arising for the users, can be a special group of users of the collective-use computer centers.

The collective-use computer centers, which are united in the future by communication channels, should be the basis of the State Network of Computer Centers. The collective-use computer center affords an opportunity for the automated exchange of data among users. The force of the Statute on the Socialist State Enterprise can be extended to collective-use computer centers, which are carried on an independent balance sheet and are legal entities. The operation of territorial collective-use computer centers is becoming possible due to third generation computers which can serve simultaneously a large number of users (see the table).

Collective-use computer cen- ters in cities	Number of users	Problems						
		account- ing	planning	analysis and fore- casting	monitor- ing	norm- setting	statis- tical	total
Minsk	20	19	20	23	7	9	35	113
Tallinn	33	39	38	28	13	5	14	179
Tomsk	20	--	2	18	5	2	9	96
Tula	18	60	42	26	51	12	9	200

The collective-use computer centers enumerated in the table were set up on the basis of the computer centers of the system of the USSR Central Statistical Administration, which are the most developed in our country. It should be emphasized that the solution of the problems of users is becoming the most important function of collective-use computer centers. Their economic effectiveness largely depends on the number of users and the problems being solved for them. Therefore great attention should be devoted to the choice of problems. The most important of them is the creation of collective-use computer centers which make it possible to solve the qualitatively new problems of planning and to attract to the sphere of information service small and intermediate enterprises, the sectors of the nonproductive sphere and enterprises of remote administrative economic regions.

Some of the most important organizational and technical measures only have to be implemented. The main one of them is the adoption of a uniform statewide program of operations on the development, production and application of computer hardware. The adoption of a uniform standard method of evaluating the economic efficiency of

automated control systems and the efficiency of various organizational forms of the use of computer hardware in the national economy was also of great importance. The adoption of such a method made it possible to eliminate instances of the double counting of the saving of the same resources at different levels of management and would make it possible to compare the real indicators.

Moreover, it is necessary to set up regular sample surveys of the efficiency of automated control systems, which are conducted according to a uniform program, the monitoring of the timely introduction of automated control systems and the proper expenditure of the allocated assets, systematic primary accounting and reporting. It is also necessary to strengthen design organizations, to broaden their rights and to adopt an effective system of the stimulation of the developers of automated control systems, to use more extensively and efficiently foreign know-how and equipment, to improve the maintenance of equipment and the training of personnel, to enlist highly skilled specialists most extensively in the development and introduction of automated control systems.

Of course, the problems which arose in this connection are not limited to the cited list. The development of the Statewide Automated System for the Collection and Processing of Data for Accounting, Planning and Management and its technical base of the State Network of Computer Centers and Statewide Network for Data Transmission is a most complicated long-range problem. It can be solved only by the joint efforts of scientists, designers and managerial workers, who cooperate on the basis of the already mentioned uniform statewide program of work.

Such are the main ways of using computer hardware and increasing its efficiency in our country.

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## REGIONAL DEVELOPMENT

### KRASNOYARSK REGION ILLUSTRATES DEVELOPMENT DIFFICULTIES

Moscow ZNAMYA in Russian No 11, Nov 80 pp 169-177

[Article by Vladimir Kvint and Mikhail Gurtovoy: "The Krasnoyarsk Experiment"]

[Text] "...The question of improving the methods of the comprehensive solution of major statewide intersectorial and territorial problems has become ripe. Uniform, centralized programs, which cover all the stages of the work—from the designing to the practical implementation—are required here." L. I. Brezhnev, from the Report of the CPSU Central Committee to the 25th party congress.

The Krasnoyarsk ten-year plan! It is difficult to say whether it is well known to the Kostroman or the resident of the Ukraine, but for the Krasnoyarsk resident, be he an electrolyzer of the aluminum plant at the kray center, an Evenk hunter, a geologist of Khatanga or a Khakass shepherd, it meant much and influenced practically all aspects of his life during the 1970's. However, this economic experiment is of all-union importance. Economists believe that the methods of planning and managing the national economy of the country during the 11th Five-Year Plan were outlined during the implementation of the program of the comprehensive development of the productive forces of Krasnoyarskiy Kray, which was adopted by the party and the government in 1971. The experience gained by the Krasnoyarsk residents will make it possible to coordinate more closely the economic programs with the social programs, the protection of nature with the unprecedented scope of its transformation, the interests of ministries and departments with the interests of the regions.

It is not out of place to recall that the Krasnoyarsk ten-year plan is, perhaps, an experiment within an experiment. Present-day Siberia is itself an experiment of world importance. It is seeking, getting to know itself, its own laws, is amazed at its own complexity, its own wealth. There are, moreover, many Siberias, they are distinguished by the climate, topography, economy, morals and daily life. And Siberians resemble each other only on the stages of the theaters of the capital. At home they are very different. The great Siberia, which means so much to our dynamically developing state, consists of these differences, the unique Siberias.

But what is the Krasnoyarsk ten-year plan?



Krasnoyarskiy Kray, the largest in territory of all our oblasts and krays (one-fiftieth, incidentally, of the planet), approached its beginning, the 1970's, with a sense of impending and sharp changes. The party policy of the anticipatory development of the eastern regions of the country forced Siberians to admit that so far they had dealt too timidly with their natural storehouses. It was a difficult admission: for they had become accustomed to at times reckless raptures, which were caused by the scale of what had already been done to the east of the Urals.

Of course, there was something to be delighted with. In the newspapers of those years there are hundreds of examples with the epithet "the most." But there were also other figures. They wrote about them less, but spoke and thought about them more.

By that time enormous natural resources had been proved in Krasnoyarskiy Kray: 40 percent of all the known lignites in the country, 13 percent of the effective water power resources, that is, those easy to put to use, 18 percent of the high grade lumber. And all this is in unique proximity. It seemed that nature itself had said to man: use my gifts comprehensively.

However, as compared with the all-union indicators the degree of development was low. This is explained in the end by the fact that the more natural resources there are, the more difficult it is to develop them more completely. But we also lagged behind the indicators of the Ural Economic Region, which in many respects is similar to our region.

In the country the scientific and technical revolution developed rapidly, not only new works, but also new sectors emerged. And the imbalance became especially perceptible: the main industrial potential was concentrated in the European part, while the raw material, fuel and power potential was concentrated in Siberia and the Far East.

The western part of the country began to sense a shortage of electric power, in Krasnoyarskiy Kray the power capacities exceeded the needs. But then the transmission of electric power over great distances involves enormous losses, for example, when sending power from Siberia beyond the Urals they would amount to the generation of an entire hydroelectric power station.

Or take timber. One of every five trees of the country grows in Krasnoyarskiy Kray. The felling of timber in the Yenisey taiga by then was already proceeding on a considerable scale, but then the timber processing capacities fell behind. They hauled beyond the Urals rough, that is, unsawed, unprocessed timber, taking up thousands of additional railroad cars. During the 1960's the hauling of rough timber doubled. But at Igarka, Yeniseysk and Maklakovo they burned at the dumps the scraps of primitive wood sawing—raw materials for the construction industry, hydrolytic and other works were destroyed.

These are only two examples out of many.

The time came to begin speaking in earnest about a comprehensive long-term program of the development of the productive forces of this most promising region of the country.

By 1970 the objective conditions had formed for the drafting and implementation of the ten-year plan, the directions had been outlined, the capital was forthcoming. But much was still unclear. For it was a matter not only and, perhaps, not so much of the fact that the time interval, for which it is necessary to calculate everything, had doubled. It was necessary to strive for the expediency, harmony and beauty of the interrelations of man with nature during the most intensive involvement of its resources in the national economic turnover.

What should the economic mechanism and system, which make it possible to take into account the interests of both the region and the sectors, whose enterprises are located here, be like? In what sequence should the natural resources be developed? Where should the processing enterprises be located? What capacities should be planned? How do you calculate the construction base and the need for manpower resources? Which ministries and departments are to be enlisted? Where on this road are the warning signs to be placed—for Siberian nature is extremely fragile, while the scars from anthropogenic interference heal more slowly here than in other regions of the country. Finally, it was also impossible to forget about the effectiveness of the development of the unique natural resources from the point of view of today's economic interests of the country.

And all this had to be solved quickly. A delay threatened losses, delay evoked among people a sense of uncertainty, and this slowed development even more.

Melancholy people with their entire families, surrounded by many bundles, sat for days at the tiny airfield of the ancient Siberian village of Kezhem. Here collectors would not know what to look at first. You will not see such ancient Siberian household utensils in every museum. They carried with them household goods, which they got from their forefathers and ancestors, in memory of the village to which they had become attached with their heart, which is so good both in the summer at sunset and during the winter cold. Not one or two, but hundreds of families were leaving. A Siberian does not fear difficulties, he can overcome much. But then he does not tolerate uncertainty. None of the people from Kezhem knew for certain whether they would build a hydroelectric power station in that place, whether they would transfer the village, and if they did, on what terms. Uncertainty gave rise to the most fantastic rumors, and they drove the people from the native area.

The global scale of the changes in Siberia required a precise program. The Krasnoyarskiy Kray Committee of the CPSU became the headquarters of its elaboration, solved hundreds of problems which gave rise to others, concentrated the efforts of scientists of Siberia and Moscow and production workers. At that time Vladimir Ivanovich Dolgikh headed the kray party organization. A native Siberian, formerly the director of the largest industrial enterprise of the Soviet Union—the Noril'sk Mining and Metallurgical Combine imeni A. P. Zavenyagin—he had enormous experience, approached every point of the plan from a state point of view and at the same time knew perfectly well how people live in a large industrial city, in a taiga worker's settlement and in a snow-covered village.

They worked dedicatedly and in concert, although, of course, they did not get by without heated arguments. The imposing contours of the program gradually began to be outlined.

It no longer aroused doubt that it was necessary to develop first of all the sectors of traditional specialization of the kray--the timber industry, metallurgy, including nonferrous metallurgy, and power engineering.

All right, let us speak about power engineering. It was decided to put an end to a harmful, as it turned out, trend: to build in the kray only hydroelectric power stations, to obtain power only from them. Inexpensive Krasnoyarsk coal can provide an increase of 15 million kWh and a great national economic efficiency--150 million rubles due to the significant differences of the production cost of 1 kWh in the system of Krasnoenergo and for the Ministry of Power and Electrification as a whole.

In addition to all else, the power engineering program of the Krasnoyarsk ten-year plan made it possible to close about 3,000 small, unprofitable electric power stations which made the sky smoky. In general the word "profitability" was one of the most significant for those who drafted the Krasnoyarsk ten-year plan. They calculated its construction program so that the efficiency would not be less than the all-union standards: the term of repayment is exacting--not more than six years. They mercilessly cut out everything that went beyond this framework. They thought about the cost, calculated it, it determined many things. Among these was the need to "make inclusive" the aluminum complex: Kiya-Shaltyr'skiy nephelines--Achinsk alumina--aluminum--rolled products--light-weight industrial construction components in Krasnoyarsk. The average efficiency of such components, which the specially built combine began to produce, is 600 rubles per ton. Let us note that the production of alumina afforded the people of Achinsk an opportunity also to obtain inexpensive cement from the tailings. The food industry should have provided (and did provide) a profit of more than 100 million rubles due to the fact that here the production cost of some types of agricultural produce is lower than the average sectorial cost. Nearly half as much capital was required for the output of a unit of this produce.

The Krasnoyarsk ten-year plan should have begun to overcome the disproportion not only between Siberia and the European part of the country, but also between the regions of the kray itself.

The time came, and the program was adopted by a decree of the party Central Committee and the Soviet Government.

Ten years passed. Difficult [trudnyy] years--both from the word "labor" [trud] and from the word "difficulties" [trudnosti]; interesting, memorable and--let us not be afraid of this word--historical years.

Eastern Siberia had not known such purposeful and at the same time intensive economic development of enormous territories.

Characterizing the Krasnoyarsk ten-year plan, L. I. Brezhnev said that it had made it possible to tie "into a single whole factors of a most different order--economic, sociopolitical, demographic and many others."

In 10 years the industrial production volume doubled. The output of nonferrous metals also doubled. They began producing 2.5-fold more products of ferrous metallurgy, machine building and metalworking, light industry. New sectors of industry

appeared--the electric equipment, machine tool building, automotive and railroad car building sectors.

All this is the result of the precisely set strategic goal: to ensure in the kray the accelerated development of natural resources and the development of the works needed first by the country.

The comprehensive development of the productive forces made it possible to actively form new cities--Lesosibirsk, Divnogorsk, Sayanogorsk, Sosnovoborsk, Svetlogorsk--and to change the appearance of old cities, first of all Krasnoyarsk.

During the years of the Krasnoyarsk ten-year plan five-units of the Sayano-Shushenskaya GES, the largest in the world, will generate a current. Our newspapers have written much about it--about the precision of the economic computations and the daring of the engineering calculations, about the new technological solutions, which stepped up the pace and increased the quality of the pouring of concrete (after all, the pressure of the Sayanskoye Sea on the dam is 18 million tons). So it makes no sense to repeat ourselves. Let us talk about something else.

Siberia is Siberia. The cold locks the cursor of a slide rule. You cannot calculate the violence of the Yenisey in advance. The people of Sayanogorsk understood this again during the days of the 1979 spring high water. The first unit, which was put into service a year ahead of time, was in operation by that time. The turbid water, which, according to all the most precise hydrometeorological estimates, was expected 15 days later and with much less force, rushed over the dam. At first it ran in streams, but then these "streams" overturned a large-tonnage crane and twirled it like a splinter, while KamAZ trucks were carried away like toy boats. The Yenisey flooded the shaft where the hydraulic turbogenerator unit was already in operation and filled the building of the GES. They shifted equipment and pumps to the battle with the elements, they also fought hand to hand--they bailed water with buckets.

The start-up of the unit is often called a holiday for hydraulic engineers. How difficult such a holiday comes!

During the days of the start-up of the second Sayansk unit (and this was also done ahead of time, after eliminating the consequences of the high water accident, that is, having in practice started up the first unit again, although this, in the opinion of specialists of other construction projects, was simply impossible) we congratulated Vladimir Grigor'yevich Dudchenko, the leader of a brigade of hydraulic installers, on the receipt of the Order of the Labor Red Banner.

We wanted to find out how his brigade had achieved a shortening of the unusually exacting period set aside by the emergency schedule. We were not able to find out at that time: Vladimir Grigor'yevich had barely sat down, when he fell asleep. Installers Oleg Vasil'yevich Grushin and Nikolay Fedorovich Korkh explained dryly: their brigade had been here for four days and they put it up, then returned to the rotor of the third unit. In a few months it should also have delivered a current.

Of course, those who calculated the control figures of the increase of power resources could not have thought that brigade leader Dudchenko would have to sleep



in snatches for weeks on end. But they were certain that if it were necessary for the fulfillment of the Krasnoyarsk ten-year plan, people would also enter the icy water of the Yenisey.

It is impossible to agree with those who believe that in modern production the heroism of some is a result of the bungling of others. Perhaps for those oblasts, where the climate is mild, this assertion is close to the truth. In Siberia, where the annual temperature gradient is 80 degrees, where the most modern automated plants are rising on land where the foot of man had previously not stepped, labor in itself is often heroism.

The timber sector of the economy of the kray increased production by 1.5-fold. But after all in the 1960's it was considered quite developed. And it is especially gratifying that mainly the more thorough processing of timber is providing a profit of 120 million rubles. Much of what was previously burned has now become a raw material for new shops of wood fiber and wood particle board. And in the taiga itself, at the logging site, they have begun to work more reasonably, more economically and more efficiently.

An example of this is the Angarsk consolidated multiple-skill brigade of USSR State Prize winner Farid Takhaviyevich Takhaviyev. During the ten-year plan it fulfilled about 20 annual assignments. In the past four years alone L. I. Brezhnev has twice congratulated the brigade on labor records.

Almost all the physical labor in the brigade has been replaced by machine labor. In logging there are VM-4 logging machines, in skidding there are the LP-18 chokerless machines.

Boldly, relying on his work prestige, Takhaviyev took under his protection the loggin machine which the skeptics so questioned, and it replaced three people at the felling area. For any Siberian timber management this is very, very important.

The love of the new is not limited here to equipment. They work according to a single brigade order, on a cost accounting basis. The best fuel, a broken cable, spare parts—you pay for everything from your own pocket. In Takhaviyev's brigade the no-load kilometerage of tractors is the lowest for the ministry. And no one here breaks seedlings and fells a tree in the wrong direction, for they turn the felling area over to forestry and a fine for faults is paid not by someone unknown, but by themselves.

Perhaps some reader will ask: if they had not adopted 10 years ago the program of the comprehensive development of the kray, would the methods of labor really not have improved, would its productivity not have increased, would new equipment not have been introduced and would new works not have been built?

Of course, all this would have occurred—true, not as rapidly. But it is not only a matter of speed. The structure of the national economy of the kray improved—both from the regional, local point of view (it began to receive more of the products needed by it for its own development) and from the point of view of the interests of the national economy of the country. Moreover, the ten-year plan coordinated these interests very closely. The sectors which it is most efficient to develop precisely in Krasnoyarskiy Kray were combined with the sectors which ensure

completeness. The same light industry provided work to second, as sociologists say, members of the family--the wives, daughters and sisters of metallurgists, loggers and miners.

However, the Krasnoyarsk ten-year plan also has results which you would not convey by figures.

Without the cultural and social program the economic and production programs would hardly have been implemented.

Now more people are coming to live in Krasnoyarskiy Kray than are leaving here. "But can it really be otherwise," you would marvel, "for working hands are needed in Siberia more than anywhere." Nevertheless, 10 years ago it was different, and not without reason. Heating, for example, costs a Siberian 9 percent more than the inhabitant of the central regions of the country, clothing--16 percent more, food--5 percent more. Surveys of sociologists showed that on the eve of the ten-year plan among those leaving the kray about 70 percent were people from 20 to 40 years old, who had general educational and vocational training. The kray was losing able-bodied and skilled people. A fifth of them left due to dissatisfaction with housing conditions, 10 percent left due to the impossibility to spend leisure time in an interesting way. And they were all certain that they would do well in a new place.

Now the situation has changed. During the ten-year plan housing affairs improved 1.5-fold. Houses of improved series, with allowance made for the Siberian climate are being built. The Opera and Ballet Theater has been opened in a magnificent building. A symphony orchestra has been set up--even at -40° you will have difficulty getting a ticket for its concerts. The largest ski jump in the country with the longest chair lift, tens of swimming pools, hundreds of skating rinks and ski bases and the first tennis court in Siberia have been built.

The list can be continued on and on. The appearance of all this on the Krasnoyarsk land is quite natural, since it was based on the plans of socio-economic development of nearly 1,500 labor collectives. Let us note that in Krasnoyarskiy Kray for the first time in the country every city and rayon drafted their own plan of social development. During the Ninth Five-Year Plan there were more than 250 of these plans, during the 10th Five-Year Plan there were sixfold more, and the fact that the ten-year plan instilled in people a taste for planning is one of its significant achievements.

It must be said that when the plans of the ten-year plan were still just being developed, there were among the managers of works those who submitted their own proposals without believing very much in their implementation. The director of a small machine plant said: "What did I think? Well, you write proposals for the ministry. This will become a part of the plans of material and technical supply and on new equipment and of others, if only by 50 percent. And then.... There is the regional administration. We are fed up with experiments. So everything will die on paper. I did not write myself. I entrusted someone, then scribbled my signature, without reading it earnestly."

Many oversights in the program of the Krasnoyarsk ten-year plan resulted from just such formal replies and from inadequately considered practical proposals from the local level.

Years passed, and the situation changed radically. People were convinced that if their proposals, their ideas were efficient, practical, they would be taken into account without fail when compiling the long-range plans and assignments for scientific institutes and associated enterprises. And now, when the goal program of the second Krasnoyarsk ten-year plan for 1981-1990 is being developed, so many proposals are coming from the enterprises that at times it is beyond the power of the coordinators to examine them and select the best ones. People are jointly pondering over the future, firmly believing that even their most daring ideas will be realized.

The ten-year plan forced many to go beyond the departmental framework. Those who did not care previously even about their neighbors learned to compare their affairs with the affairs of the entire kray.

Yuriy Petrovich Tatarinov, an experienced engineer of the Krasnoyarsk Plant of Nonferrous Metals, heads a group attached to the kray committee of the party, which is elaborating the prospects of scientific and technical progress of nonferrous metallurgy. The Noril'sk Combine, the Sayansk Aluminum Combine, which is under construction, and the Sorsk Molybdenum Combine should produce a sizeable share of the industrial output of the kray. The group is trying to decide how to meet the needs of the country for metals and alloys, including those which are not at all produced today. The recommendations are long-range—they should yield the greatest impact after two or three five-year plans.

It is not by chance that when they decided who should head the group, the choice fell to Tatarinov, an experienced engineer, scientist and inventor.

He was one of the first to suggest using the apatites of Maymecha-Kotuyskiy province in Taymyr in the technological processes of the Noril'sk Combine in order to obtain at the same time phosphorus fertilizers on a large scale. It is hard to exaggerate the importance of this proposal. Siberia accounts for one-fifth of the land area of the country, but they produce less than one-thirtieth of the fertilizers here. It is expensive, of course, to transport it. But this misfortune is not the only one. Some 30 percent of the fertilizers are lost during unloading, loading and storage at unadapted warehouses of railroad sidings.

And then jointly with other specialists the metallurgist, whom the ten-year plan taught to think along state lines, found the key to solving this problem. This, too, is one of the laws of scientific and technical progress. The majority of discoveries are now made at the meeting point of sciences, and people with a broad outlook, who think in terms of the future, are making them.

When 10 managers of different enterprises were asked: "What did the Krasnoyarsk ten-year plan teach you?" almost all of them responded in the same way: "The ability when making everyday decisions to think about the future, to think about efficiency."

known such a scale of open-cut coal mining as here: the Berezovka open pit alone will yield 55 million tons a year. A group of thermal power stations with a capacity of more than 6 million kW each also belongs here. So the KATEK not only will enrich the already established industrial centers, but also will, of course, give rise to hundreds of power-consuming works.

At the Noril'sk Territorial Production Complex the Combine imeni Avraamiy Pavlovich Zavenyagin has brought together everything that man needs for life under extreme conditions. This is a splendid example of how remote territories must be developed carefully and how the natural resources of the Far North must be utilized comprehensively. Moreover, this experience is valuable not only for the USSR, where the zone of the North is more than half of the total territory. Many countries of Scandinavia, Canada and the United States are faced with the need to involve the northern expanses in the economic turnover. Canadian Prime Minister Pierre Elliott Trudeau, having visited Noril'sk, noted that the significance of our experience is worldwide.

So why do they frequently speak about incompleteness in Krasnoyarskiy Kray?

Yes, the course of development is quite natural: the lessons of the Krasnoyarsk ten-year plan are inseparable from its results.

In the residential town of the Minusinsk Electrical Equipment Complex there was neither a dining room nor a laundry? Why? Because of the forgetfulness of the architect? The scatter-brainedness of the manager? This, too, of course. But the main thing is that the Ministry of the Electrical Equipment Industry reduced the allocations, postponed the date of financing and, hence, the date of construction.

At the Achinsk Industrial Center the Ministry of the Petroleum Refining and Petrochemical Industry shifted by four years the date for the placement of the first capacities of the petroleum refinery into operation. The reason at first glance was convincing: the capital was needed for expanding the production of already operating enterprises. Let us look at the narrow departmental gain from a national economic standpoint. The redistribution upset the harmonious, scientifically sound arrangement. The powerful construction organization was without a workload. The citywide services of Achinsk were not set up. If the experts of Gosplan of the country had demanded from the ministry calculations which reflected the complete expenditures according to the altered and approved versions, it would have become clear: the consumers of the kray and the Tuvinskaya ASSR will have to bring in petroleum products from far away for another five years by the railroad, which is loaded to the utmost as it is. Thus, the transportation costs and the idling of entire works (the Achinsk Alumina Combine, for example) are due to delays and irregularities.

At Lesosibirsk they postponed the construction of the hydrolytic yeast plant and the pulp and paper combine. The result is that nearly 90 percent of the scrap wood is burned there in the dumps.

Deviations from the scientifically sound layouts of complexes deprive people of conveniences, at times elementary ones, hence the turnover of personnel, and this in turn injures basic production and decreases its efficiency.



In the central newspapers Krasnoyarskiy Kray is called the kray of territorial production complexes. Yet in the local newspapers it is often possible to read reproaches for incompleteness when developing the productive forces. As strange as it may seem, there is no contradiction here.

Krasnoyarskiy Kray is indeed rich in territorial production complexes. Speaking at the 25th CPSU Congress, First Secretary of the Krasnoyarskiy Kray party committee of the Pavel Stefanovich Fedirko noted that the formation of eight industrial centers had already begun in the kray, while in all there would be 12 of them.

It is well known that the territorial production complex is strong in the contacts between its enterprises. These contacts were strengthened throughout the kray: between the territorial production complexes, the industrial centers and the individual works. And this increased the economic return, the national economic impact of the kray. Transportation expenditures were reduced—the items of one enterprise or another became the raw materials and components for a neighboring enterprise.

Thus, the proportion of the final product increased. And whereas earlier in practice only raw materials for processing went to the European part of the country, now 40,000 highly productive combines, scarce railroad flatcar-container cars, containers themselves, light-weight aluminum components, high voltage vacuum switches and trailers go there.

In turn, the cooperation of the enterprises of the kray and the better considered sectorial structure increased the completeness in the use of natural resources.

And here is the result. In 1980 the kray began to generate nearly twice as much electric power as in 1970. The mining of coal and the production of pulp also increased by approximately the same amount. They began to produce 1.5-fold more pipe and precast reinforced concrete parts, artificial rubber; 2.5-fold more agricultural machinery, overhead cranes and knitwear; 3-fold more cardboard.

Each of the complexes is interesting in its own way. The Sayansk Complex—the offspring of the Krasnoyarsk ten-year plan—is an example of how on a gigantic territory according to the European scale they have attempted to distribute harmoniously the works of different ministries and to firmly unite them by mutually advantageous cooperative ties.

Not everything has turned out as intended. But the analysis of the errors and miscalculations will help in the further work. The Turukhansk Industrial Region and the Angara Region Territorial Production Complex will be developed intensively during the next ten-year plan. It is possible to judge the scale of this advance on the North if only from the following comparison: in area the Angara Region of Krasnoyarskiy Kray exceeds Great Britain, Yugoslavia and Romania taken together.

The Central Krasnoyarsk Complex unites a mighty economic region—a large portion of the population of the kray and a significant proportion of the fixed industrial capital are concentrated here. The previously disconnected individual enterprises are being renovated and form economically efficient chains, in which the output of some serves as raw materials for others. Another complex, the Kansk-Achinsk Fuel and Power Complex—KATEK—is arising in the complex itself. The planet has not yet

The department "economizes" on housing, on social, general and cultural projects in order to release capital for basic production. But this "saving" results in enormous losses due to the impossibility of bringing the capacities up to the planned level. Moreover, a skilled, stable collective does not form at the works. The territorial organs are not able to resist such arbitrariness. There are neither financial nor economic barriers in the way of incompleteness. And you will not solve everything by administrative methods.

Prohibitive functions have been given to the State Committee for Construction Affairs: it can prohibit the construction of works which are not contained in the layout of the complex. It seems that the judicious combination of territorial management with sectorial management is necessary. Then these will be not opposing aspects, as it now is in other instances, but mutually strengthening aspects.

It is difficult to say what the regional economic organ will be--a coordinating council or the headquarters of the territorial production complex, but it will be a competent manager without fail.

Completeness should exist in everything and everywhere, in the approach to every phenomenon--here, perhaps, is the main lesson of the Krasnoyarsk ten-year plan. And it is taken into account in the new program of the development of the productive forces of Krasnoyarskiy Kray up to 1990.

This program calls for the improvement of the structure, the further formation of already established territorial production complexes and the most intensive development of new regions, primarily in the Angara region, where two new large cities and several very large hydroelectric power stations will appear. The construction of a plant of heavy-duty excavators, which is not inferior in capacity to Uralmash, will be completed in Krasnoyarsk. The self-propelled and rotary giants which it will begin to produce will help to remove the coal of the KATEK.

In the past inadequate attention was devoted to regional scientific and technical policy. Now a special comprehensive goal program has been compiled: the accelerated introduction of automatic equipment, the mechanization of loading and unloading operations, equipment of northern design--all this will help to reduce the shortage of manpower. The labor-saving impact, as economists like to say, is 250,000 people. Thousands of people will be released from difficult manual labor and will cease to work in shops with harmful conditions. Incidentally, if it were otherwise, this labor army of many thousands would have to be brought to Siberia and set up here, and this would be a great expense--more than 3 billion rubles.

Yes, Siberia is heading for 1990, is looking to the next century, the next millennium. It turned out that we wrote these lines in Noril'sk. There, perhaps, as nowhere else in the kray, you sense the ability of the people of Krasnoyarskiy Kray. While successfully solving current problems, they do not forget the future for a moment. They see in details the whole. They remember the balanced approach to the development of Siberia's wealth, not the departmental gain alone, but also the state gain.

This is also one of the results of the Krasnoyarsk experiment. But the overall evaluation of the ten-year plan is found in the words of L. I. Brezhnev. Speaking at a meeting with the members of the bureau of the Krasnoyarskiy Kray party committee, he emphasized that the comprehensive nature of the development of the sectors of the kray is of great importance for the economy of the entire country.

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